9/504330

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Search Results - Record(s) 1 through 10 of 12 returned.

Cite

1. Document ID: US 6578005 B1

L6: Entry 1 of 12 File: USPT Jun 10, 2003

US-PAT-NO: 6578005
DOCUMENT-IDENTIFIER: US 6578005 B1

TITLE: Method and apparatus for resource allocation when schedule changes are incorporated in real time

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

2. Document ID: US 6546364 B1

X

L6: Entry 2 of 12 File: USPT Apr 8, 2003

US-PAT-NO: 6546364
DOCUMENT-IDENTIFIER: US 6546364 B1

TITLE: Method and apparatus for creating adaptive workflows

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

3. Document ID: US 6321133 B1

L6: Entry 3 of 12 File: USPT Nov 20, 2001

X

US-PAT-NO: 6321133
DOCUMENT-IDENTIFIER: US 6321133 B1

TITLE: Method and apparatus for order promising

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

4. Document ID: US 6044355 A

A

L6: Entry 4 of 12 File: USPT Mar 28, 2000

US-PAT-NO: 6044355
DOCUMENT-IDENTIFIER: US 6044355 A

TITLE: Skills-based scheduling for telephone call centers

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC
Draw Desc | Image

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5. Document ID: US 6032123 A

L6: Entry 5 of 12 File: USPT Feb 29, 2000

A

US-PAT-NO: 6032123
DOCUMENT-IDENTIFIER: US 6032123 A

TITLE: Method and apparatus for allocating, costing, and pricing organizational resources

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

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6. Document ID: US 5999908 A

L6: Entry 6 of 12 File: USPT Dec 7, 1999

US-PAT-NO: 5999908
DOCUMENT-IDENTIFIER: US 5999908 A

TITLE: Customer-based product design module

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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A

not ACO

7. Document ID: US 5826040 A

L6: Entry 7 of 12 File: USPT Oct 20, 1998

US-PAT-NO: 5826040
DOCUMENT-IDENTIFIER: US 5826040 A

TITLE: Method and system for production planning

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

NO

8. Document ID: US 5706200 A

L6: Entry 8 of 12 File: USPT Jan 6, 1998

US-PAT-NO: 5706200
DOCUMENT-IDENTIFIER: US 5706200 A

TITLE: Scheduling system and scheduling method for reentrant line processes

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

9. Document ID: US 5623413 A

NO

L6: Entry 9 of 12 File: USPT Apr 22, 1997

US-PAT-NO: 5623413
DOCUMENT-IDENTIFIER: US 5623413 A

TITLE: Scheduling system and method

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

10. Document ID: US 5586021 A

NO

L6: Entry 10 of 12 File: USPT Dec 17, 1996

US-PAT-NO: 5586021
DOCUMENT-IDENTIFIER: US 5586021 A

TITLE: Method and system for production planning

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
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Terms	Documents
L5 and ((agent or employ$ or skill$) with availab$)	12

Display Format: TI Change Format

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Search Results - Record(s) 11 through 12 of 12 returned.

11. Document ID: US 5487144 A

L6: Entry 11 of 12 File: USPT Jan 23, 1996

NO

US-PAT-NO: 5487144
DOCUMENT-IDENTIFIER: US 5487144 A

TITLE: Scheduling system

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

12. Document ID: US 5442561 A

NO

L6: Entry 12 of 12 File: USPT Aug 15, 1995

US-PAT-NO: 5442561
DOCUMENT-IDENTIFIER: US 5442561 A
**** See image for Certificate of Correction ****

TITLE: Production management system and its application method

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC
Draw Desc | Image

Generate Collection | Print

Terms	Documents
L5 and ((agent or employ$ or skill$) with availab$)	12

Display Format: TI | Change Format

Previous Page Next Page

WEST

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Not "call" L6: Entry 1 of 12 File: USPT Jun 10, 2003

A

DOCUMENT-IDENTIFIER: US 6578005 B1
TITLE: Method and apparatus for resource allocation when schedule changes are incorporated in real time

Application Filing Date (1):
19980319

Detailed Description Text (13):
Other factors, such as the amount of non-productive time required for a specified technician to carry out the task (e.g. time spent in travelling, or waiting at the location for access if a "not before" appointment time has been made) can also be taken into account. It should be recognised that these costs are estimates. In some circumstances, the cost may be on a sliding scale, dependent on the time that the task is actually performed. However, in many cases, the actual cost of allocating the task can in reality only take one of two values, the value (negative cost) of success, or the failure cost, but at the time of allocation it is not known which of those values it will take, as unforeseen circumstances may prevent the technician arriving on time (or at all), or may prevent him carrying out the task on time, or at all, if he does arrive. There are further factors, such as the ability of the technician to perform the task (taking into account skills, equipment, and access permits available to each individual), which must also be taken into account. For these factors, the probability of the task failing can take only the values zero (if the technician is suitably qualified, etc.) or 1 (if he is not so qualified). Preferences for types of work, e.g. because a particular technician desires to gain experience in a particular skill, can also be expressed by intermediate values.

Detailed Description Text (62):
Each of these four elements will now be described, beginning with the objective function. This provides an objective assessment of which of two solutions to the problem being addressed is better, and whether a move being considered improves the solution or makes it worse. The function is summed across all tasks in the system, whether these tasks are scheduled or not, and irrespective of whether the pre-scheduler or the simulated annealer positioned the task in the tour. The objective function can be thought of as being made up of four components. These components are: a travel penalty; an overtime penalty; a skill bias penalty; the cost of allocation--i.e. a measure of the risk and cost of failure, or a contingency value.

Current US Original Classification (1):
705/8

Current US Cross Reference Classification (1):
705/7

Current US Cross Reference Classification (2):
705/9

WEST

Generate Collection Print

L6: Entry 2 of 12 File: USPT Apr 8, 2003

US-PAT-NO: 6546364
DOCUMENT-IDENTIFIER: US 6546364 B1

TITLE: Method and apparatus for creating adaptive workflows

DATE-ISSUED: April 8, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Smirnov; Yuri V.	Palo Alto	CA		
Nelson; Phillip C.	San Jose	CA		
Winner; Jeffrey B.	Los Altos	CA		
Soung; Yuh-Wen	Saratoga	CA		
Goodrow; Cristos J.	San Francisco	CA		
Flight; John L.	Sunnyvale	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Impresse Corporation	Sunnyvale	CA			02

APPL-NO: 09/ 216355 [PALM]
DATE FILED: December 18, 1998

INT-CL: [07] G06 F 9/45, G06 F 19/00

US-CL-ISSUED: 703/22; 700/100, 705/8, 703/2
US-CL-CURRENT: 703/22; 700/100, 703/2, 705/8

FIELD-OF-SEARCH: 705/8, 705/7, 705/10, 705/100, 705/105, 700/96, 700/107, 706/19, 703/6, 703/2, 703/22

PRIOR-ART-DISCLOSED:

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Search Selected Search ALL

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3581072	May 1971	Nymeyer	
3703006	November 1972	Sharma	
3703725	November 1972	Gomersall et al.	
T918004	January 1974	Chappell et al.	
3905045	September 1975	Nickel	
3930251	December 1975	Salava et al.	

☐	3988570	October 1976	Murphy et al.	
☐	4007362	February 1977	Sindermann	
☐	4017831	April 1977	Tieden et al.	
☐	4231096	October 1980	Hansen et al.	
☐	4400783	August 1983	Locke, Jr. et al.	
☐	4433426	February 1984	Forster	
☐	4449186	May 1984	Kelly et al.	
☐	4468750	August 1984	Chamoff et al.	
☐	4475156	October 1984	Federico et al.	
☐	4484522	November 1984	Simeth	
☐	4495582	January 1985	Dessert et al.	
☐	4578768	March 1986	Racine	
☐	4584648	April 1986	Dlugos	
☐	4601003	July 1986	Yoneyama et al.	
☐	4648023	March 1987	Powell	364/156
☐	4796194	January 1989	Atherton	
☐	4839829	June 1989	Freedman	
☐	5016170	May 1991	Pollalis et al	364/401
☐	5053970	October 1991	Kurihara et al.	364/468
☐	5212791	May 1993	Damian et al.	395/650
☐	5229948	July 1993	Wei et al.	
☐	5233533	August 1993	Edstrom et al.	364/468
☐	5278750	January 1994	Kaneko et al.	364/401
☐	5287194	February 1994	Lobiondo	358/296
☐	5291394	March 1994	Chapman	364/401
☐	5291397	March 1994	Powell	
☐	5369570	November 1994	Parad	705/8
☐	5406476	April 1995	Deziel, Jr. et al.	364/402
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☐	5463555	October 1995	Ward et al.	
☐	5504568	April 1996	Saraswat et al.	355/308
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☐	5630070	May 1997	Dietrich et al.	395/208
☐	5729790	March 1998	Conley et al.	399/77
☐	5734837	March 1998	Flores et al.	395/207
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☐	5754857	May 1998	Gadol	395/680
☐	5757669	May 1998	Christie et al.	364/514.006
☐	5765139	June 1998	Bondy	705/8
☐	5768506	June 1998	Randell	395/200
☐	5778364	July 1998	Nelson	707/6
☐	5794207	August 1998	Walker et al.	

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11110451	April 1999	JP	
WO 96/10793	April 1996	WO	
WO 96/16365	May 1996	WO	
WO 97/07472	February 1997	WO	
WO 97/28506	August 1997	WO	
WO 97/29441	August 1997	WO	
WO 97/31322	August 1997	WO	

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`A Knowledge Based, Integrated Process Planning and Scheduling System for document Preparation`; Roger M. Kerr; XP-000892975; pp. 479-509 (Copy in IDS of paper #7).*
"Introduction to Algorithms"; Cormen, Leiserson and Rivest, 1989, Published by MgGraw-Hill Book Company; pp 86-90 & 541-543.*
PCT International Search Report; International Application No. PCT/US99/24177; Apr. 6, 2000.
PCT International Search Report; International Application No. PCT/US99/24178; Apr. 6, 2000.
PCT International Search Report; International Application No. PCT/US99/24381; Feb. 29, 2000.
PCT International Search Report; International Application No. PCT/US99/24193; Feb. 5, 2000.
PCT International Search Report; International Application No. PCT/US99/24131 Dec. 4, 1998.
PCT International Search Report; International Application No. PCT/US 24132; Feb. 22, 2000.
"A Knowledge Based, Integrated Process Planning and Scheduling System for Document Preparation"; Roger M. Kerr; XP-000892975; pp. 497-506.
"Heuristic Knowledge Representation of Production Scheduling: An Integrated Modeling Approach"; Sung Joo Park and Jong Woo Kim; XP-000893055; pp. 325-339.
"From Contemporary Workflow Process Automation to Adaptive and Dynamic Work Activity Coordination and Collaboration"; Amit Sheth; XP-002135795 pp. 24-27.
Towards Evolutionary and Adaptive Workflow Systems--Infrastructure Support Based on Higher-Order Object Nets and CORBA; Ingo ClaBen, Herbert Weber and Yanbo Han; XP-002135793; pp. 300-308.
"A Fine Mes"; State of the Art; Jim Esch; Petersborough, NH, US; No. 12; pp. 67, 68, 70, 74, 75.
"Simulation System for Real-Time Planning, Scheduling, and Control"; Glenn R. Drake and Jeffrey S. Smith; pp. 1083-1090.
"Electronic Contracting with COSMOS-How To Establish, Negotiate and Execute Electronic Contracts on the Internet"; F. Griffel, M. Boger, H. Weinrcich, W. Lamersdorf and M. Merz; XP-002129707; pp. 46-55.
"Workflow Management Coalition Terminology & Glossary", Document No. WFMC-TC-1011,

Document Status--Issue 2.0, Jun. 1996, (55 pg.).
"Workflow Management Coalition, The Workflow Reference Model", Document No. TC00-1003, Document Status--Issue 1.1, Nov. 29, 1994, (46 pg.).
"Workflow Management Coalition, Workflow Security Considerations--White Paper", Document No. WFMC-TC-1019, Document Status--Issue 1.0, Feb. 1998, (15 pg.).
"Workflow Management Coalition, Workflow Client Application (Interface 2), Application Programming Interface (WAPI) Specification", Document No. WFMC-TC-1009, Oct. 1997, Version 2.0e (Beta), (178 pg.).

ART-UNIT: 2123

PRIMARY-EXAMINER: Frejd; Russell

ATTY-AGENT-FIRM: Blakely, Sokoloff, Taylor & Zafman LLP

ABSTRACT:

A scheduling engine and an associated workflow engine may be configured to build workflows that describe sequences of tasks to be performed in a dynamically changing environment. The workflow engine may be configured to monitor the execution of the tasks within the environment and to provide the scheduling engine with information regarding deviations of task executions from the workflows. When such deviations are detected, the workflow engine may trigger the scheduling engine to rebuild the workflows for as yet uncompleted tasks. The scheduling engine may receive the information regarding the deviations via a declarative model of the physical environment. In general, the tasks may be a set of job requests to be processed in a manufacturing environment (e.g., a print shop). Also, the scheduling engine may be made up of an aggregate planner and a detailed scheduler. Aggregate plans for the jobs may be first made for the jobs and then passed to the detailed scheduler for timelining, etc. Building the aggregate plans may be accomplished by selecting a subset of the job requests according to a procedure for packing bins representing the resources of the manufacturing plant.

12 Claims, 7 Drawing figures

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L6: Entry 2 of 12 File: USPT Apr 8, 2003

DOCUMENT-IDENTIFIER: US 6546364 B1
TITLE: Method and apparatus for creating adaptive workflows

Application Filing Date (1):
19981218

Detailed Description Text (8):
Consider now the following scenario. A number of jobs, perhaps each at various stages of completion and each having certain deadlines for completion, are waiting to be processed. Each job has an associated cost of completion and each completed job has an associated value. Any job not completed on time carries an associated penalty, which may or may not have a linear relationship with the delay. The task facing the owner of the hypothetical print shop then, is to decide how best to employ the available resources and materials to complete the existing job requests within their designated time frames while optimizing for cost/value. In other words, the print shop owner needs to determine what work to do, when to do it, what resources to apply/utilize, etc., to complete the products. To this task can be added the complication that while the shop is running and without disrupting the in-progress operations, the print shop owner would like to be able to accept new orders, each of which will carry its own completion time deadlines, costs and values.

Detailed Description Text (10):
Before going further, it is helpful to define some terms. A bill of materials, as used herein, is a summary that defines a product structure. More than merely a parts list, a bill of materials provides some idea of how a product is assembled from its constituent parts. In some cases, it may indicate the types and quantities of subassemblies required to produce the product. Although the bill of materials shows the assembly chain for the product, it does not provide any information as to how or when the assembly is to be completed. A bill of resources on the other hand, is a precise list of the available reusable resources that may be employed to assemble the product. For example, the various machines that are located on the print shop floor comprise at least a portion of the print shop's bill of resources. In some cases, outside vendors and suppliers may be part of the bill of resources.

Current US Cross Reference Classification (3):
705/8

Other Reference Publication (15):
"Simulation System for Real-Time Planning, Scheduling, and Control"; Glenn R. Drake and Jeffrey S. Smith; pp. 1083-1090.

WEST

Generate Collection Print

L6: Entry 5 of 12 File: USPT Feb 29, 2000

US-PAT-NO: 6032123
DOCUMENT-IDENTIFIER: US 6032123 A

TITLE: Method and apparatus for allocating, costing, and pricing organizational resources

DATE-ISSUED: February 29, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Jameson; Joel	Palo Alto	CA	94301	

APPL-NO: 09/ 070130 [PALM]
DATE FILED: April 29, 1998

PARENT-CASE:
CROSS REFERENCE TO RELATED APPLICATION The present application is a continuation of provisional application serial number 60/046,173, filed May 12, 1997.

INT-CL: [07] G06 F 17/60

US-CL-ISSUED: 705/8; 700/99, 705/400
US-CL-CURRENT: 705/8; 700/99, 705/400

FIELD-OF-SEARCH: 364/156, 364/468.01, 364/468.05, 705/1, 705/7, 705/8, 705/800, 700/36, 700/95, 700/99

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
3090557	May 1963	Levi	364/156
4797839	January 1989	Powell	364/554
5101352	March 1992	Rembert	364/401
5189606	February 1993	Burns et al.	364/401
5241621	August 1993	Smart	395/51
5249120	September 1993	Foley	705/1
5255181	October 1993	Chapman et al.	364/401
5255345	October 1993	Shaefer	395/13
5295065	March 1994	Chapman et al.	364/401
5311438	May 1994	Sellers et al.	364/468
5321605	June 1994	Chapman et al.	364/402
5381332	January 1995	Wood	364/401
5404516	April 1995	Georgiades et al.	395/650
5615109	March 1997	Eder	395/208
5884276	March 1999	Zhu et al.	705/8
5884300	March 1999	Brockman	705/2

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FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
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"Linear Programming and Economic Analysis", by Paul Samuelson et al., Chapter 7, 1958.
"RIM Multiparametric Linear Programming", by Tomas, Gal, Management Science 21, pp. 567-575, 1975.
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"Generalized Benders Decomposition", by Geoffrion, A.M., Journal of Optimization Theory and Applications 10, pp. 237-260, 1972.
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"Linear Programming in Managerial Accounting: A Misinterpretation of Shadow Prices",

by Harper, Robert M., Jr., pp. 123-190, 1986.
"Handbooks in Operations Search and Management Science vol. 1, Optimiation", North-Holland Publishing Co., Amsterdam, 1989.
"End-User Optimization with Spreadsheet Models", by Roy, Asim, et al;, European Journal of Operations Research, pp. 131-137, 1989.
A practical Approach to Decomposable Nonlinear Programming Problems:, by Wakahara,Tatsuro, et al., Journal of Operations Research Society of Japan 36, pp. 1-12, 1993.

ART-UNIT: 271

PRIMARY-EXAMINER: Cosimano; Edward R.

ABSTRACT:

This invention is a means both to allocate all types of resources for commercial, governmental, or non-profit organizations and to price such resources. A linear programming process makes fulfillment allocations used to produce product units. A Resource-conduit process governs the linear programming process, uses two-sided shadow prices, and makes aperture allocations to allow Potential-demand to become Realized-demand. A strict opportunity cost perspective is employed, and the cost of buyable resources is deemed to be the opportunity cost of tying up cash. Resource available quantities, product resource requirements, and Potential-demand as a statistical distribution are specified in a database. The invention reads the database, performs optimization, and then writes allocation directives to the database. Also determined and written to the database are resource marginal (incremental) values and product marginal costs. The database can be viewed and edited through the invention's Graphical User Interface. Monte Carlo simulation, along with generation of supply and demand schedules, is included to facilitate analysis, explore "what if," and interact with the user to develop product offering, product pricing, and resource allocation strategies and tactics.

36 Claims, 38 Drawing figures

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L6: Entry 5 of 12 File: USPT Feb 29, 2000

DOCUMENT-IDENTIFIER: US 6032123 A
TITLE: Method and apparatus for allocating, costing, and pricing organizational resources

Abstract Text (1):
This invention is a means both to allocate all types of resources for commercial, governmental, or non-profit organizations and to price such resources. A linear programming process makes fulfillment allocations used to produce product units. A Resource-conduit process governs the linear programming process, uses two-sided shadow prices, and makes aperture allocations to allow Potential-demand to become Realized-demand. A strict opportunity cost perspective is employed, and the cost of buyable resources is deemed to be the opportunity cost of tying up cash. Resource available quantities, product resource requirements, and Potential-demand as a statistical distribution are specified in a database. The invention reads the database, performs optimization, and then writes allocation directives to the database. Also determined and written to the database are resource marginal (incremental) values and product marginal costs. The database can be viewed and edited through the invention's Graphical User Interface. Monte Carlo simulation, along with generation of supply and demand schedules, is included to facilitate analysis, explore "what if," and interact with the user to develop product offering, product pricing, and resource allocation strategies and tactics.

Application Filing Date (1):
19980429

Brief Summary Text (86):
For example, owned office space is typically a fixed resource: an organization is not apt to continuously buy and sell office space as "needs" vary. Public utility services are buyable resources, since they are frequently, if not continuously, purchased. Employees can be considered either fixed or buyable resources. If an organization generally wants to retain its employees through ups and downs, then employees are fixed resources. If an organization wants employees strictly on a day-to-day as-needed basis, then they are buyable resources. Note that for all fixed resources, including employees, periodic payments, such as salaries, are not directly considered by the present invention: the invention optimally allocates fixed resources presuming their availability is fixed; current payments for such resources is irrelevant to the decision of optimal allocation. Whether the quantities of fixed resources are increased or decreased is decided exogenously of the invention by the user. To help the user, the invention generates marginal values and demand curves that help anticipate the effects of changing fixed resource quantities.

Detailed Description Text (161):
The preferred embodiment builds upon the previously described basic embodiment and makes possible all the previously described objects and advantages. It entails enhancements to the database, handling of cash related resources, Monte Carlo simulation, operation under a GUI (Graphical User Interface), optimization controls, and generating supply and demand schedules that facilitate analysis.

Detailed Description Text (163):
A Base simulation is the basic simulation done to allocate resources and determine marginal costs/values. A Supply simulation generates the schedule between product

price and optimal mean supply quantity. Similarly, a Demand simulation generates the schedule between external resource price and optimal quantities.

Current US Original Classification (1):
705/8

WEST

Generate Collection | Print

L6: Entry 7 of 12 File: USPT Oct 20, 1998

US-PAT-NO: 5826040
DOCUMENT-IDENTIFIER: US 5826040 A

TITLE: Method and system for production planning

DATE-ISSUED: October 20, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fargher; Hugh E.	Allen	TX		
Smith; Richard A.	Garland	TX		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Texas Instruments Incorporated	Dallas	TX			02

APPL-NO: 08/ 573210 [PALM]
DATE FILED: December 13, 1995

PARENT-CASE:
This application is a Continuation of application Ser. No. 08/483,602 filed on Jun. 7, 1995, now abandoned, which is a continuation of application Ser. No. 07/857,018 filed Mar. 24, 1992, now U.S. Pat. No. 5,586,021.

INT-CL: [06] G06 F 19/00

US-CL-ISSUED: 395/208
US-CL-CURRENT: 705/8

FIELD-OF-SEARCH: 364/401, 364/402, 364/403, 364/468, 364/41R

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4796194	January 1989	Atherton	364/468
☐	5040123	August 1991	Barber et al.	364/401
☐	5053970	October 1991	Kurihara et al.	395/926
☐	5099431	March 1992	Natarajan	364/468
☐	5128860	July 1992	Chapman	364/401
☐	5148370	September 1992	Litt et al.	395/926
☐	5212791	May 1993	Damian et al.	395/926
☐	5214773	May 1993	Endo	395/61

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Foo et al., "Stochastic Neural Networks for Soving Job-Shop Scheduling: Part 1. Problem Representation", IEEE Inter. Conf. on Neural Networks, Jul. 24-27, 1988, pp. II-275 through 282.
Foo et al., "Stochastic Neural Networks for Soving Job-Shop Scheduling: Part 2. Problem Representation", IEEE Inter. Conf. on Neural Networks, Jul. 24-27, 1988, pp. II-283 though 290.

ART-UNIT: 241

PRIMARY-EXAMINER: McElheny, Jr.; Donald E.

ATTY-AGENT-FIRM: Swayze, Jr.; W. Daniel Brady, III; W. James Donaldson; Richard L.

ABSTRACT:

A method for planning a production schedule within a factory is disclosed herein. A capacity model is determined for the factory. The capacity model is determined by determining a plurality of contiguous time intervals, partitioning the factory into a plurality of resource groups, and determining a processing capacity for each of the resource groups for each of the time intervals. For each job to be planned, the job is divided into a plurality of processing segments each of which is represented with a corresponding fuzzy set. The fuzzy set representations are inserted and removed within the capacity model until the job is planned. A completion date and a confidence level can be predicted for each of the jobs. In addition, the jobs may be released to the factory and devices fabricated according to the requirements of the jobs. Other systems and methods are also disclosed.

19 Claims, 12 Drawing figures

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L6: Entry 7 of 12 File: USPT Oct 20, 1998

DOCUMENT-IDENTIFIER: US 5826040 A
TITLE: Method and system for production planning

Application Filing Date (1):
19951213

Brief Summary Text (6):
In order to configure a production plan which yields the best performance, the capacity, or the amount of work the facility can handle, must be modeled in some fashion, since starting work above the capacity of the facility compromises performance and brings forth no benefits. Conventional factory capacity models employ simple steady-state linear relations that include: (1) the average amount of available work time for each machine in the factory and (2) the amount of work each product requires of each machine. From the above linear relations, a given start plan is within capacity if, for each machine, the total required amount of work is: (1) less than the machine's available time, and (2) multiplied by a predetermined fraction goal utilization of the start rate.

Detailed Description Text (6):
An important part of future manufacturing systems is the development of the CIM environment responsible for coordinating all parts of the system. The CIM architecture may be based on a distributed object oriented framework made of several cooperating subsystems. Software subsystems may include: Process Control for dynamic control of factory processes; Modular Processing System for controlling the processing equipment; Generic Equipment Model which provides an interface between processing equipment and the rest of the factory; Specification System which maintains factory documents and product specifications; Simulator for modelling the factory for analysis purposes; Scheduler for scheduling work on the factory floor; and the Planner for planning and monitoring of orders within the factory.

Detailed Description Text (10):
Referring first to FIG. 1, a simplified block diagram of the planner 10 in relation to some of the other functions is illustrated. In general, the planner 10 receives inputs from the user 12, from the manufacturing requirements 14 and from the factory 16. Also, an parameters input 19 may exist to provide information for the planner 10. The planner 10 may also interact with a scheduler 18 and/or a simulator 20.

Detailed Description Text (17):
The following is a description of the relationship between the planner 10, the scheduler 18 and the simulator 20 for the preferred embodiment system. One role of the planner 10 is to plan and predict work completion dates, given a required confidence level, set of plan goals, and the current state of the factory. This requires that the plan representation model factory resource utilization over time, and that the plan be continually updated to reflect unexpected events such as machine failure. This role is not provided by the scheduler 18, which performs more locally based decision making.

Current US Original Classification (1):
705/8

WEST

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No

L6: Entry 8 of 12 File: USPT Jan 6, 1998

US-PAT-NO: 5706200
DOCUMENT-IDENTIFIER: US 5706200 A

TITLE: Scheduling system and scheduling method for reentrant line processes

DATE-ISSUED: January 6, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kumar; Panganamala Ramana	Urbana	IL		
Richardson; Ray M.	Tempe	AZ		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
The Board of Trustees of the University of Il.	Urbana	IL			02

APPL-NO: 08/ 698150 [PALM]
DATE FILED: August 15, 1996

INT-CL: [06] G06 F 19/00

US-CL-ISSUED: 364/468.06; 395/208
US-CL-CURRENT: 700/100; 705/8

FIELD-OF-SEARCH: 364/468.05, 364/468.06, 364/468.07, 364/468.08, 364/468.23, 364/488-491, 364/578, 395/208, 395/209, 395/672, 395/673, 395/674, 395/675

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5233533	August 1993	Edstrom et al.	364/468.09
5291397	March 1994	Powell	364/468.03
5546326	August 1996	Tai	364/468.05 X

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Lawrence M. Wein, Scheduling Semiconductor Wafer Fabrication, IEEE Transactions on Semi-conductor Manufacturing, pp. 115-130 (Aug. 1988).
Steve Lu, Deepa Ramaswamy, and P.R. Kumar, Efficient Scheduling Policies to Reduce Mean and Variance of Cycle-Time in Semiconductor Manufacturing Plants, IEEE Transactions on Semiconductor Manufacturing, pp. 374-388 (Aug. 1994).
David Sohl and P.R. Kumar, Fluctuation Smoothing Scheduling Policies for Multiple

Process Flow Fabrication Plants, International Electronics Manufacturing Technology Symposium--Austin, Tex., U.S.A. (Oct. 1995).
David Louis Sohl, Fluctuation Smoothing Scheduling Policies for Multiclass Queuing Networks, University of Illinois at Urbana-Champaign, May 1995, Thesis.
Chad Andrew Griffin, Fluctuation Smoothing Scheduling Policies for Semiconductor Manufacturing Plants, University of Illinois at Urbana-Champaign, 1994, Thesis.

ART-UNIT: 236

PRIMARY-EXAMINER: Ruggiero; Joseph

ATTY-AGENT-FIRM: Wood, Phillips, VanSanten, Clark & Mortimer

ABSTRACT:

A multiple-product reentrant line scheduling method includes the steps of storing a time measurement variable for each one of a plurality of incomplete products disposed in a buffer at a workstation, the time measurement variable representing the entry of the incomplete product into the reentrant line, storing a time measurement variable for the buffer representing the time remaining for incomplete products of the same product type disposed in the buffer to be completed, calculating the difference between the stored time measurement variable for each incomplete product and the stored time measurement variable for the buffer to generate a slack variable for each incomplete product, normalizing the slack variable for each incomplete product by comparing the slack variable of each incomplete product with the slack variables for all incomplete products of same product type that have passed through the workstation to generate a selection variable for each incomplete product, comparing the selection variables to select one of the incomplete products for processing at the workstation, and processing the selected incomplete product. An apparatus for carrying out the scheduling method is also provided.

10 Claims, 5 Drawing figures

WEST

Generate Collection Print

NO

L6: Entry 9 of 12 File: USPT Apr 22, 1997

US-PAT-NO: 5623413
DOCUMENT-IDENTIFIER: US 5623413 A

TITLE: Scheduling system and method

DATE-ISSUED: April 22, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Matheson; William L.	Palm Bay	FL		
Julich; Paul M.	Indialantic	FL		
Crone; Michael S.	W. Melbourne	FL		
Thomae; Douglas A.	Melbourne	FL		
Vu; Thu V.	W. Melbourne	FL		
Wills; M. Scott	Melbourne	FL		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Harris Corporation	Melbourne	FL			02

APPL-NO: 08/ 299271 [PALM]
DATE FILED: September 1, 1994

INT-CL: [06] G06 F 17/60, B61 L 27/00

US-CL-ISSUED: 364/436; 364/426.05, 246/2R, 104/307, 395/208
US-CL-CURRENT: 701/117; 104/307, 246/2R, 701/20, 705/8

FIELD-OF-SEARCH: 364/426.05, 364/401, 364/402, 364/406, 364/468, 364/436, 246/1R, 246/2R, 246/2F, 104/307, 395/902

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
3575594	April 1971	Elcan	246/2R
3734433	May 1973	Metzner	246/1R
3839964	October 1974	Gayot	104/18
3895584	July 1975	Paddison	246/63R
4122523	October 1978	Morse et al.	364/436
4669047	May 1987	Chucta	364/468
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4883245	November 1989	Erickson, Jr.	246/2R
4926343	May 1990	Tsuruta et al.	364/513
4937743	June 1990	Rassman et al.	364/401
5038290	August 1991	Minami	364/436
5063506	November 1991	Brockwell et al.	364/402
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5289563	February 1994	Nomoto et al.	395/902
5311438	May 1994	Sellers et al.	364/468
5331545	July 1994	Yajima et al.	364/401
5335180	August 1994	Takahashi et al.	364/555
5365516	November 1994	Jandrell	340/991
5390880	February 1995	Fukawa et al.	246/167R
5420883	May 1995	Swensen et al.	342/450
5448489	August 1995	Newman	364/436
5463552	October 1995	Wilson et al.	364/436

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FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
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2692542	June 1993	FR	

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Hasselfield et al., "An Automated Method for Least Cost Distribution Planning", IEEE Trans on Power Delivery, vol. 5 No. 2, Apr. 1990, 1188-1194.
Igarashi, "An Estimation of Parameters in an Energy Fcn Used in an Simulated Annealing Method", IEEE, 1992, pp. IV-180-IV-485.
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Scherer et al., "Combinatorial Optimization For Spacecraft Scheduling", 1992 IEEE Int. Conf on Tolls with AI, Nov. 1992, pp. 120-126.
Herault et al., "Figure-Ground Discrimination: A Combinatorial Optimization Approach", IEEE Trans on Pattern Anal. & Machine Intell., vol. 15 No. 9, Sep. 1993, 899-914.
PCT Int'l Search Report, PCT/US95/10969.
Komaya, "A New Simulation Method and its appl. to Knowledge-based Sys for Railway Sch", May 1991, pp. 59-66.
"Innovative Train Control System by Radio", Y. Hasegawa, QR of RTRI, vol. 30, No. 4, Nov. 1989, pp. 181-189.
"Novel Train Control System Applicable to Railway Lines with Heavy Traffic", H. Oshima et al., Japanese Railway Engineering No. 110, Jun. 1989, pp. 1-4.
"Moving Block System with Continuous Train Detection Utilizing Train Shunting Impedance of Track Circuit", I. Watanabe et al., QR of RTRI, vol. 30, No. 4, Nov. 1989, pp. 190-197.
"Development for a New Electronic Blocking System", T. Sasaki et al., QR of RTRI, vol. 30, No. 4, Nov. 1989, pp. 198-201.

ART-UNIT: 234

PRIMARY-EXAMINER: Teska; Kevin J.

ASSISTANT-EXAMINER: Walker; Tyrone V.

ATTY-AGENT-FIRM: Rogers & Killeen

ABSTRACT:

A scheduling system and method for moving plural objects through a multipath system described as a freight railway scheduling system. The achievable movement plan can be used to assist in the control of, or to automatically control, the movement of trains through the system.

50 Claims, 12 Drawing figures

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L6: Entry 9 of 12 File: USPT Apr 22, 1997

DOCUMENT-IDENTIFIER: US 5623413 A
TITLE: Scheduling system and method

Application Filing Date (1):
19940901

Detailed Description Text (43):
The resource scheduler 330 may be any suitable conventional general purpose or special purpose computer capable of scheduling the passage of the various trains over the track system with a high degree of optimization. However, and as discussed infra in greater detail in connecting with FIG. 5, the resource scheduler 330 is desirably one which uses the well known simulating annealing techniques to approximate the optimum solution.

Detailed Description Text (55):
As earlier indicated, the search for an acceptable schedule may employ various suitable conventional techniques, but the preferred technique is that of simulated annealing discussed above. If no acceptable schedule is available because of the length of the group time intervals, the interval groups are returned to the interval grouper 324 for division at the gaps into smaller groups. After division, they may be returned to the resource scheduler 330 and the scheduling process repeated. This scheduling process continues with smaller and smaller time intervals until the interval groups can no longer be divided, as there are no gap-able time intervals in any group of time intervals.

Detailed Description Text (72):
The resource scheduler 330 employs a dynamic, distributed, robust, and efficient version of simulated annealing written in the COPES shell. It is dynamic in that its behavior may be controlled by parameters passed with scheduling requests by the system wide planner (such as demurrage costs in the form of a polynomial cost function), by parameters defined in the COPES database, and by information inherent in the scheduling problem itself. It is a distributed algorithm in that train trips are COPES class objects each having constraint objects bound to them which fire independently of each other. The solution thus derived must be more independent of the problem domain than is the case with more sequential algorithms and is therefore a more robust approach. It is an efficient implementation in that it employs a compact representation of each resource required as COPES objects with availability profiles and a temporal logic approach which manipulates these availability profiles in an efficient manner as a trip is added or removed. The temporal logic also considers constraints such as moving block distances. Global costs of such a move are modified as a side effect.

Detailed Description Text (73):
The operation of focused simulated annealing in COPES in the resource scheduler 330 of FIG. 4 is illustrated in FIG. 5. With reference now to FIG. 5, a constraint-based system flow of a such a resource scheduler is illustrated. The bold names in ovals (such as op.sub.-- resource.sub.-- usage) are the constraint routines (they are not limited to reducing the search space but may also generate solutions). They are only fired by the COPES inference engine when a class variable to which they are bound is modified. The names shown in rectangular boxes (such as resource.sub.-- usage) are class objects with state variables not shown in the interest of clarity.

Detailed Description Text (115):
In the event that the procedural means is provided, it also is implemented as one or more asynchronous UNIX processes. These processes communicate using a well-known client-server inter-process communications. The procedural means is used to refine the schedule to include details of the rail system. This is accomplished by simulating the operation of the railroad, identifying the conflicts in the schedule which result from the level of model abstraction used in the constraint-based process, and adjusting the schedule to eliminate those conflicts while at the same time maximizing the performance measure.

Detailed Description Text (145):
The procedural system 516 receives the schedule and a state of the rail network (position of trains) from an external source and initializes a simulation capability with the definition of each of the trains and their initial point. The definition of a train includes the number and type of locomotives, the number and type of cars and the weight of the cars. The position of each train includes its position of the train, its direction on the track, and its velocity. The motions of all of the scheduled trains is simulated until a train conflict occurs, a specified stop condition occurs, or the simulation time interval is reached.

Detailed Description Text (175):
A simulation support manager is provided to initialize the resource database, the multi-level modelling of rail topology, the railway signalling model, and the train movement in response to an external request to perform a simulation. The request to perform a simulation includes the simulation time, the schedule, route, time, increment, trains and their locations, and a list of scheduled actions. An externally supplied schedule contains a route for each train and a schedule for each train. The schedule specifies the list of fragments over which the train will pass and the time that a train departs from a stopped point on the route.

Detailed Description Text (176):
Scheduled actions include "move train to fragment x and stop". A capability is thus provided to move the trains forward, by issuing a command to the train movement section 804 of FIG. 8, until the next event and to report back to the requesting external processor. The next event may be a scheduled event, or it may be an unscheduled event such as a train conflict. Upon completion, whether caused by reaching a scheduled event or caused by an unscheduled event, the history of the simulation and the stop condition or conflict situation encountered is returned to the external process which requested the simulation.

Current US Cross Reference Classification (4):
705/8

CLAIMS:

24. A method of planning the implementation of an order schedule over a system comprising the steps of:

(a) providing the order schedule to be implemented;

(b) identifying the resources and location of resources necessary to implement each of the orders;

(c) providing a detailed model of the system over which the schedule is to be implemented;

(d) simulating the schedule on the model to identify and resolve conflicts;

(e) displaying a planned implementation of the schedule

(f) communicating to a train the train's portion of the planned implementation; and

(g) determining in a processor on the train throttle and brake settings for implementing the plan.

31. The method of claim 29 wherein the movable resource data is statistical in the development of the schedule and simulated in the development of the movement plan.

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L6: Entry 10 of 12 File: USPT Dec 17, 1996

US-PAT-NO: 5586021
DOCUMENT-IDENTIFIER: US 5586021 A

TITLE: Method and system for production planning

DATE-ISSUED: December 17, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fargher; Hugh E.	Allen	TX		
Smith; Richard A.	Garland	TX		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Texas Instruments Incorporated	Dallas	TX			02

APPL-NO: 07/ 857018 [PALM]
DATE FILED: March 24, 1992

INT-CL: [06] G06 F 19/00

US-CL-ISSUED: 364/468.06; 364/468.28, 395/207
US-CL-CURRENT: 700/100; 700/121, 705/7

FIELD-OF-SEARCH: 364/401, 364/468, 395/900, 395/926, 395/61

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4796194	January 1989	Atherton	364/468
5040123	August 1991	Barber et al.	364/401
5053970	October 1991	Kurihara et al.	395/926
5099431	March 1992	Natarajan	364/468
5128860	July 1992	Chapman	364/401
5148370	September 1992	Litt et al.	395/926
5212791	May 1993	Damian et al.	395/926
5214773	May 1993	Endo	395/61

OTHER PUBLICATIONS

"Stochastic Neural Networks for Solving Job-Shop Scheduling: Part 1, Problem Representation", Foo et al., IEEE Inter. Conf. on Neural Networks, Jul. 24-27, 1988, pp. II-275 through 282.
"Stochastic Neural Networks for Solving Job-Shop Scheduling: Part 2. Architecture and Simulations", Foo et al. IEEE Inter. Conf. on Neural Networks, Jul. 24-27, 1988, pp. II-283 through 290.
R. Kerr & R. Walker: "A Job Shop Scheduling System based on Fuzzy Arithmetic", Proc. of 3rd Int. Con. on Expert Systems & Leading Edge in Prod. & Operations Man., pp. 433-450, 1989.

ART-UNIT: 241

PRIMARY-EXAMINER: McElheny, Jr.; Donald E.

ATTY-AGENT-FIRM: Swayze, Jr.; W. Daniel Wade, III; W. James Donaldson; Richard L.

ABSTRACT:

A method for planning a production schedule within a factory is disclosed herein. A capacity model is determined for the factory. The capacity model is determined by determining a plurality of contiguous time intervals, partitioning the factory into a plurality of resource groups, and determining a processing capacity for each of the resource groups for each of the time intervals. For each job to be planned, the job is divided into a plurality of processing segments each of which is represented with a corresponding fuzzy set. The fuzzy set representations are inserted and removed within the capacity model until the job is planned. A completion date and a confidence level can be predicted for each of the jobs. In addition, the jobs may be released to the factory and devices fabricated according to the requirements of the jobs. Other systems and methods are also disclosed.

19 Claims, 12 Drawing figures

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L6: Entry 10 of 12 File: USPT Dec 17, 1996

DOCUMENT-IDENTIFIER: US 5586021 A
TITLE: Method and system for production planning

Application Filing Date (1):
19920324

Brief Summary Text (6):
In order to configure a production plan which yields the best performance, the capacity, or the amount of work the facility can handle, must be modeled in some fashion, since starting work above the capacity of the facility compromises performance and brings forth no benefits. Conventional factory capacity models employ simple steady-state linear relations that include: (1) the average amount of available work time for each machine in the factory and (2) the amount of work each product requires of each machine. From the above linear relations, a given start plan is within capacity if, for each machine, the total required amount of work is: (1) less than the machine's available time, and (2) multiplied by a predetermined fraction goal utilization of the start rate.

Detailed Description Text (5):
An important part of future manufacturing systems is the development of the CIM environment responsible for coordinating all parts of the system. The CIM architecture may be based on a distributed object oriented framework made of several cooperating subsystems. Software subsystems may include: Process Control for dynamic control of factory processes; Modular Processing System for controlling the processing equipment; Generic Equipment Model which provides an interface between processing equipment and the rest of the factory; Specification System which maintains factory documents and product specifications; Simulator for modelling the factory for analysis purposes; Scheduler for scheduling work on the factory floor; and the Planner for planning and monitoring of orders within the factory.

Detailed Description Text (9):
Referring first to FIG. 1, a simplified block diagram of the planner 10 in relation to some of the other functions is illustrated. In general, the planner 10 receives inputs from the user 12, from the manufacturing requirements 14 and from the factory 16. Also, an parameters input 19 may exist to provide information for the planner 10. The planner 10 may also interact with a scheduler 18 and/or a simulator 20.

Detailed Description Text (16):
The following is a description of the relationship between the planner 10, the scheduler 18 and the simulator 20 for the preferred embodiment system. One role of the planner 10 is to plan and predict work completion dates, given a required confidence level, set of plan goals, and the current state of the factory. This requires that the plan representation model factory resource utilization over time, and that the plan be continually updated to reflect unexpected events such as machine failure. This role is not provided by the scheduler 18, which performs more locally based decision making.

Current US Cross Reference Classification (2):
705/7

Other Reference Publication (2):
"Stochastic Neural Networks for Solving Job-Shop Scheduling: Part 2. Architecture

and Simulations", Foo et al. IEEE Inter. Conf. on Neural Networks, Jul. 24-27, 1988, pp. II-283 through 290.

WEST

09/504330

Must cite

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L6: Entry 5 of 6 File: USPT Oct 15, 1996

US-PAT-NO: 5566097
DOCUMENT-IDENTIFIER: US 5566097 A

TITLE: System for optimal electronic debugging and verification employing scheduled cutover of alternative logic simulations

DATE-ISSUED: October 15, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Myers; John D.	Endwell	NY		
Rivero; Jose L.	Boca Raton	FL		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
International Business Machines Corporation	Armonk	NY			02

APPL-NO: 08/ 027016 [PALM]
DATE FILED: March 5, 1993

INT-CL: [06] G06 F 19/00

US-CL-ISSUED: 364/578; 364/400, 364/402, 395/500
US-CL-CURRENT: 703/15; 700/90, 705/8

FIELD-OF-SEARCH: 364/488, 364/578, 364/400, 364/401, 364/402, 364/488, 364/570, 364/578, 371/23, 371/25.1, 371/9.1, 395/500, 395/275, 395/183.01, 379/15

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
3767863	October 1973	Borbas et al.	379/15
3812297	May 1974	Borbas	371/9.1
4590581	May 1986	Widdoes, Jr.	364/578
4638451	January 1987	Hester et al.	395/275
4801870	January 1989	Eichelberger et al.	371/25.1
4872125	October 1989	Catlin	364/578
4899273	February 1990	Omoda et al.	364/200
4899306	February 1990	Greer	364/900
4901260	February 1990	Lubachevsky	364/578
4937765	June 1990	Shupe et al.	364/578 X
5018089	May 1991	Kanazawa	364/578
5053980	October 1991	Kanazawa	364/578
5202889	April 1993	Aharon et al.	371/27
5208765	May 1993	Turnbull	364/552
5237508	August 1993	Furukawa et al.	364/468
5278750	January 1994	Kaneko et al.	364/401

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
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3225811	January 1984	DE	

OTHER PUBLICATIONS

"Functional Testing Index" by M. J. Campion et al, IBM Technical Disclosure Bulletin, vol. 23, No. 3, Aug. 1980, p. 985.

ART-UNIT: 244

PRIMARY-EXAMINER: Cosimano; Edward

ATTY-AGENT-FIRM: Baker, Maxham, Jester & Meador

ABSTRACT:

A system for determining the optimal circuit design simulator schedule for debugging a digital electronic circuit design. The system characterizes all available circuit design simulators in terms of several parameters reflecting simulator speed and the time required to discover, isolate and fix a design error (bug). A cutover point is established for any pair of available simulators on the basis of these parameters. One simulator is progressively more efficient than the other beyond this cutover point, which is the desired time for scheduling substitution of the more efficient simulator during the debugging process. The system also permits "what-if" evaluation of alternative debugging strategies in advance by creating alternative schedules in response to various characteristic parameters.

8 Claims, 11 Drawing figures

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L6: Entry 5 of 6 File: USPT Oct 15, 1996

DOCUMENT-IDENTIFIER: US 5566097 A
TITLE: System for optimal electronic debugging and verification employing scheduled cutover of alternative logic simulations

Abstract Text (1):
A system for determining the optimal circuit design simulator schedule for debugging a digital electronic circuit design. The system characterizes all available circuit design simulators in terms of several parameters reflecting simulator speed and the time required to discover, isolate and fix a design error (bug). A cutover point is established for any pair of available simulators on the basis of these parameters. One simulator is progressively more efficient than the other beyond this cutover point, which is the desired time for scheduling substitution of the more efficient simulator during the debugging process. The system also permits "what-if" evaluation of alternative debugging strategies in advance by creating alternative schedules in response to various characteristic parameters.

Application Filing Date (1):
19930305

Brief Summary Text (9):
Thus, the designer has no available formal method for advance scheduling of circuit design simulation resources and cutover points. This is a clearly felt need in the art. The circuit designer is often left without formal grounds for continuing the debug simulation at a certain level when confronted by management imperatives to "push ahead" to hardware prototyping. Without formal means for optimal cutover to prototyping, the first prototype often incorporates more design errors that would otherwise be found after "adequate" debugging in "soft" simulators. This increases costs for everybody concerned, as do unnecessary prototyping delays arising from overcaution.

Brief Summary Text (14):
This invention solves the above problem by applying for the first time an explicit model for the scheduling of available simulators in a digital system debugging process. This method produces and displays a simulation "cutover" schedule based upon selected characteristics identified for each available simulator, including: (a) operating speed; (b) the average time needed to isolate a "bug" identified in the simulation; (c) the average time needed to design and implement a fix for such a bug; (d) an overall estimate of the total number of bugs in the initial design; (e) an estimate of the percentage of all bugs to be found that are "show-stoppers" requiring the simulation and debugging procedure to halt until a fix is implemented; (f) an estimate of the number of cycles of simulation required to identify the "last bug"; and (g) the fraction of weekly time that each simulator is available.

Brief Summary Text (21):
It is an advantage of this invention that formal procedures are provided for scheduling simulator cutover, whereas only intuition and "gut-feel" techniques are available in the art.

Detailed Description Text (8):
h.sub.i =simulator availability factor=hours per week times number of i.sup.th simulators

Detailed Description Text (25):
The cutover bug number n.sub.ci for an i.sup.th pair of simulators (S.sub.i, S.sub.i+1) may be determined by considering the following relationships. Debug time for a simulator S.sub.i is the sum of the simulation run time to find a bug, c.sub.i * M(n.sub.ci), and the average fix delay time, D.sub.i, where ~~c.sub~~.i =the machine cycle time for the i.sup.th simulator. This estimated debug time may be divided by a derating factor h.sub.i reflecting the daily (or weekly) ~~simulator~~ availability, which can be more or less than one full-time simulator (h.sub.i =number of i.sup.th simulators times average hours per week).

Current US Cross Reference Classification (2):
705/8

CLAIMS:

1. A machine-implemented method for scheduling a plurality of circuit design simulators {S} for debugging of a digital electronic circuit design having no more than N bugs that are discoverable in no more than M(N)=M simulated machine cycles of said digital electronic circuit design, where the n.sup.th said bug is discoverable in M(n) simulated machine cycles using any one or more of said plurality of circuit design simulators {S}, each two of which form a simulator pair (S.sub.i, S.sub.i+1), each said simulator S.sub.i having an availability fraction h.sub.i, having a machine cycle time c.sub.i, having an average fix delay time D.sub.i equal to the mean time between discovery of and the correction of said n.sup.th bug for all values of n, and having a debug time for said n.sup.th bug equal to the time required to discover and fix said n.sup.th bug, wherein i and n are non-zero positive integers, said method comprising the steps of:

(a) estimating the number of said machine cycles M(n.sub.ci) required to discover a cutover bug number n.sub.ci for which said debug times are most nearly equivalent in both of an i.sup.th said pair of simulators (S.sub.i, S.sub.i+1);

(b) estimating a predicted discovery time for said cutover bug number n.sub.ci corresponding to the time required to complete said machine cycles M(n.sub.ci) for one of said simulators in said i.sup.th pair of simulators (S.sub.i, S.sub.i+1);

(c) displaying a debugging simulation schedule for said i.sup.th pair of simulators (S.sub.i, S.sub.i+1) wherein said predicted discovery time for said cutover bug number n.sub.ci corresponds to the scheduled time for cutover of said simulated machine cycles from the first said simulator S.sub.i to the second said simulator S.sub.i+1 of said i.sup.th pair of simulators (S.sub.i, S.sub.i+1); and

(d) during simulation of the digital electronic circuit by the first said simulator S.sub.i, transitioning said simulation of the digital electronic circuit to the second said simulator S.sub.i+1 at said scheduled time for cutover.

WEST

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L6: Entry 1 of 6 File: USPT Jul 11, 2000

US-PAT-NO: 6088678
DOCUMENT-IDENTIFIER: US 6088678 A
**** See image for Certificate of Correction ****

TITLE: Process simulation technique using benefit-trade matrices to estimate schedule, cost, and risk

DATE-ISSUED: July 11, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Shannon; Diane M.	Westchester	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Raytheon Company	Lexington	MA			02

APPL-NO: 08/ 629666 [PALM]
DATE FILED: April 9, 1996

INT-CL: [07] G06 F 15/00, G06 F 15/46, G06 F 17/60

US-CL-ISSUED: 705/8; 705/7, 705/9
US-CL-CURRENT: 705/8; 705/7, 705/9

FIELD-OF-SEARCH: 705/8, 705/7, 705/9

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5233533	August 1993	Edstrom et al.	364/486
5692125	November 1997	Schloss et al.	395/209
5737728	April 1998	Sisley et al.	705/8

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Frame, J. Davidson, "The New Project Management", Jossey-Bass Publishers, pp. 85-94, 1994.
Frame, J. Davidson, "Management Projects in Organizations", Jossey-Bass Publishers, pp. 171-183, 1995.
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Kanof P., "Una applicazione di Manutenzione studiata con gli utenti". Sistemi e

End of Result Set

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L11: Entry 1 of 1 File: USPT Aug 12, 2003

DOCUMENT-IDENTIFIER: US 6606744 B1
TITLE: Providing collaborative installation management in a network-based supply chain environment

Application Filing Date (1):
19991122

Brief Summary Text (4):
The ability to quickly, easily and efficiently communicate has always been a critical component, if not a necessity, for successful business operations. Today, as the global economy continues to expand, the ability to communicate is even more important. In partial response to these demands, sophisticated telecommunications equipment has been developed that permits users to quickly and easily place, receive, transfer and switch telephone calls as well as provide advanced features such as call accounting and voice messaging functionality. As these features have become widely available in local telecommunications equipment, such as private branch exchange (PBX) telephone switches, central offices, key and hybrid telephone systems (small telecommunications switches), call accounting systems, voice messaging systems, computer telephony interface (CTI) devices, automatic call distribution (ACD) devices, internet servers, etc., the demand for and installation of these systems has continued to expand. Often, a vast number of sites have layered or "integrated" two or more of the aforementioned devices and rarely are these different devices using the same operating system or of the same brand. More often, these differing devices include a mixture of operating systems and brands.

Detailed Description Text (348):
In accordance with a preferred embodiment, a callback system is facilitated by a caller accessing a display from a computer and filling out information describing the parameters of a call. Information such as the date and time the call should be initiated, billing information, and telephone numbers of parties to participate in the call could be captured. Then, based on the information entered, a central or distributed computing facility with access to the hybrid network transmits e-mail in a note to each party required for the call copying the other parties to verify participation and calendar the event. The e-mail would include any particulars, such as the password associated with the call and time the call would be commenced. The necessary network facilities would also be reserved to assure the appropriate Quality of Service (QOS) would be available, and when the date and time requested arrived, the call is initiated by contacting each of the participants whether they be utilizing a telephone attached to a PSTN or a voice capable apparatus (such as a computer or intelligent television) attached to the hybrid network. At any time during scheduling, initiation or duration of the call, any party could request operator assistance by selecting that service from the display associated with the call. Thus, a completely automated callback system is provided for call setup and control.

Detailed Description Text (649):
This is called "concurrent licensing". In these environments, a computer program, acting as "librarian" and running on a computer node designated as a license server, is typically used to distribute license keys (sometimes called "tokens") over the network to nodes requesting access to run a software product; the number of keys is tracked by the librarian; and if at a given time, the permitted maximum number of keys would be exceeded by usage of the software product on a requesting node, the node can be denied, at such time, access to invoke the software product.

Detailed Description Text (1160):
WEB SITE TESTING TOOLS (PERFORMANCE & LINK SPIDERS) Simulates multiple users on web site Allows pages to be retrieved and programmatically navigated by simulated clients Logs error messages Records performance statistics Enables programmatic control of load generation Allows tests to be scheduled and load to be varied over time

Detailed Description Text (1649):
In a similar situation, if a consumer in a first location wants to make a video call to someone in a second location and pay for the call, unless their Distributed Virtual Network Service (DVNS) has purchased bandwidth in the LAC of the second location, a bandwidth provider can not complete the call. This limitation has serious implications. First, many applications can not to traverse DVNS boundaries, forcing a customer to only communicate with others who share their same distributor. Second, as most distributors are probably be focused on offering a single service (e.g. DSS TV or Internet access), their customers can not access other services on a bandwidth provider's network. The bandwidth provider can become a network dedicated to singular functions. People who wish to access multiple services may need to subscribe to more than one distributor, and may require additional Customer Premise Equipment (CPE).

Detailed Description Text (1650):
In order to allow customers to access any location or service on bandwidth providers' networks, it is necessary for distributors to be able to buy and sell bandwidth. If a customer wants to make a video call to a location in which its distributor does not have bandwidth, the DVNS should be able to purchase bandwidth from another distributor who has excess capacity. Ideally, this could be done on a real-time basis so that customers can immediately access the location or service. Not only does this provide a mechanism for customers to cross DVNS geographic and service boundaries, but it also provides a way for distributors to sell off their excess bandwidth. As distributors can now sell off unused bandwidth in a secondary market, they are more likely to purchase additional wholesale capacity. Like other commodities, bandwidth could be traded among distributors, ultimately resulting in an efficient market.

Detailed Description Text (1692):
Another problem with the 24 hour requirement is that it does not allow a customer to transparently access irregular services or locations. If a customer decides that they want to call an unusual location or access a service that has not been pre-negotiated by their DVNS, they may have to call up their distributor to have them acquire the appropriate service for the next day. A customer in the United States may not be willing to contact its service provider 24 hours in advance to setup a video conference call to someone in Botswana.

Detailed Description Text (1699):
FIG. 133 outlines the exemplary contract negotiation of FIG. 132 in more detail. In Step #1, a DVNS 13300 that has purchased too much bandwidth packages their excess capacity and posts it to one of the segments on the bandwidth market 13302. When a customer call request comes in and the distributor 13304 does not have the bandwidth available (Step #2), its DVNS 13306 first determines the appropriate call parameters. It then bids on and purchases bandwidth from the bandwidth market 13302 (Step #3). The bandwidth market 13302 completes and records the transaction (Step #4), and forwards the contract information, including bandwidth, location, service levels, and Contract ID, to each DVNS 13300,13306 involved in the transaction (Step #5). The information is also forwarded to the rating, clearing, and settlements processes in the Network Business Center (CNBC) 13308. When the information is successfully received by the DVNS 13306, the contract information, including the Contract ID, is forwarded to the CPE 13304 along with other call setup information (Step #6). After the call is established, the CPE 13304 periodically sends cumulative Raw Usage Data (RUD) information to its DVNS 13306 (Step #7). Either at the end of the call or an appropriate interval, the DVNS 13306 cuts an Event Data Record (EDR) and forwards it to the Network Business Center (CNBC) 13308 (Step #8) for rating and settlements processing (Step #9).

Detailed Description Text (1712):
One of the key functions of the clearinghouse is to offer a mechanism to bill back services between distributors. If a DVNS in Thailand purchases bandwidth from an American distributor in order to complete a video call to the United States, the American distributor needs some mechanism for receiving payment from the Thai DVNS.

As all distributors must deal with a bandwidth provider at some level, it makes sense for the bandwidth provider to provide clearing functions between distributors. The clearing function may allow the US DVNS to bill the Thai DVNS for the bandwidth that it used. The Thai DVNS may then bill its customer for the call. By leveraging a bandwidth provider's fiduciary relationship with each DVNS, the bandwidth market, when coupled with a clearinghouse function, provides a mechanism for one distributor to indirectly bill another distributor's customers.

Current US Cross Reference Classification (1):
705/26

End of Result Set

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L7: Entry 1 of 1 File: USPT Jun 10, 2003

US-PAT-NO: 6578005
DOCUMENT-IDENTIFIER: US 6578005 B1

TITLE: Method and apparatus for resource allocation when schedule changes are incorporated in real time

DATE-ISSUED: June 10, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lesaint; David	Ipswich			GB
Voudouris; Christos	Ipswich			GB
Azarmi; Nader	Colchester			GB
Laithwaite; Robert N. W.	Bucklesham			GB
O'Donoghue; John J	Ispwich			GB
Noble; Andrew P	Richmond			GB
Walker; Paul	Bolton			GB
Alletson; Ian S	Rochdale			GB

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
British Telecommunications public limited company	London			GB	03

APPL-NO: 09/ 043423 [PALM]
DATE FILED: March 19, 1998

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
EP	96308478	November 22, 1996

PCT-DATA:

APPL-NO	DATE-FILED	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
PCT/GB97/03118	November 12, 1997	WO98/22897	May 28, 1997		

INT-CL: [07] G06 F 17/60

US-CL-ISSUED: 705/8; 705/9, 705/7
US-CL-CURRENT: 705/8; 705/7, 705/9

FIELD-OF-SEARCH: 705/8, 705/7, 705/9

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5111391	May 1992	Randall et al.	705/9
5260868	November 1993	Gupta et al.	700/100
5343388	August 1994	Wedelin	705/8
5467268	November 1995	Sisley et al.	364/403
5524077	June 1996	Faaland et al.	705/8
5799286	August 1998	Morgan et al.	705/30
5923552	July 1999	Brown et al.	700/100
5943652	August 1999	Sisley et al.	705/9

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0 938 714	January 2001	EP	
WO 95 26535	October 1995	WO	

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D J Parrott et al., "Comparing the WMS Real Time Algorithm with AIP Predictive Schedulers", BT Technol J., vol. 12, No. 4, Oct. 1994.
J Simpson et al., "Experience in Applying OR Techniques to the Solution of Practical Resource Management Problems", BT Technol J, vol. 13, No. 1, Jan. 1995.

ART-UNIT: 3623

PRIMARY-EXAMINER: Hafiz; Tariq R.

ASSISTANT-EXAMINER: Robinson-Boyce; Akiba

ATTY-AGENT-FIRM: Nixon & Vanderhye P.C.

ABSTRACT:

A plurality of resources, typically service operatives, are allocated to a plurality of tasks by a method in which initial information relating to the tasks to be allocated and the resources available to perform the tasks is provided. An initial

series of schedules is first generated allocating resources to the tasks, and then modifying the individual schedule of at least one resource in response to updated information. Changes to individual schedules may be made in response to such updated information independently of the schedule generation. The initial, series of schedules may be generated in a two-stage process in which a rule-based system allocates tasks selected as being difficult to allocate (e.g., because they are linked to other tasks). then a stochastic (non-systematic) search system compiles the rest of the schedule. Periodically, the stochastic system may be interrupted to allow a further rule-based system to analyze the schedules created thus far, and fix the best ones in the schedule, so that the stochastic system can then concentrate on improving the remaining schedules. In order to allow the system to handle rapid changes in the requirements for tasks and the resources, on a scale faster than the time required to generate the schedules, a schedule modification system is arranged to make changes in the short term in between schedule updates delivered by the schedule generation system.

107 Claims, 17 Drawing figures

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L7: Entry 1 of 1 File: USPT Jun 10, 2003

DOCUMENT-IDENTIFIER: US 6578005 B1
TITLE: Method and apparatus for resource allocation when schedule changes are incorporated in real time

Application Filing Date (1):
19980319

Brief Summary Text (3):
This invention relates to a method for optimising the allocation of a plurality of resources to a plurality of tasks, and to an apparatus for performing such a method. It is particularly suited for use in situations where the availability of resources, and the tasks to be performed, both change dynamically. An example of such a situation is the allocation of tasks to a field force of personnel, for example ambulance or taxi drivers, a vehicle repair call-out field force, or a maintenance field force for a distributed system such as an electricity or water supply system or a telecommunications network.

Detailed Description Text (62):
Each of these four elements will now be described, beginning with the objective function. This provides an objective assessment of which of two solutions to the problem being addressed is better, and whether a move being considered improves the solution or makes it worse. The function is summed across all tasks in the system, whether these tasks are scheduled or not, and irrespective of whether the pre-scheduler or the simulated annealer positioned the task in the tour. The objective function can be thought of as being made up of four components. These components are: a travel penalty; an overtime penalty; a skill bias penalty; the cost of allocation--i.e. a measure of the risk and cost of failure, or a contingency value.

Current US Original Classification (1):
705/8

Current US Cross Reference Classification (1):
705/7

Current US Cross Reference Classification (2):
705/9

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L11: Entry 1 of 1   File: USPT   Aug 12, 2003

US-PAT-NO: 6606744
DOCUMENT-IDENTIFIER: US 6606744 B1

TITLE: Providing collaborative installation management in a network-based supply chain environment

DATE-ISSUED: August 12, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mikurak; Michael G.	Hamilton	NJ		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Accenture, LLP	Palo Alto	CA			02

APPL-NO: 09/ 444654 [PALM]
DATE FILED: November 22, 1999

INT-CL: [07] G06 F 9/445

US-CL-ISSUED: 717/174; 717/174, 717/178, 705/26
US-CL-CURRENT: 717/174; 705/26, 717/178

FIELD-OF-SEARCH: 717/168, 717/170, 717/171, 717/174, 717/177, 717/172, 717/102, 717/176, 717/178, 705/1, 705/21, 705/26, 705/28, 709/201, 709/217, 709/227

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

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PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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4972453	November 1990	Daniel et al.	
5109337	April 1992	Ferriter et al.	
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5297031	March 1994	Gutterman et al.	
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5539877	July 1996	Winokur et al.	

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☐	5974403	October 1999	Takriti et al.	
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"User's Guide for Microsoft Project." 1995; Microsoft Corporation. pp. 3,4,14-16, 82-84, 91, 130, 132-134, 175, 209. Document No. Pj62476-0895.

ART-UNIT: 2122

PRIMARY-EXAMINER: Khatri; Anil

ATTY-AGENT-FIRM: Oppenheimer Wolff & Donnelly, LLP Nader; Rambed

ABSTRACT:

A system, method and article of manufacture are provided for collaborative installation management in a network-based supply chain environment. According to an embodiment of the invention, telephone calls, data and other multimedia information are routed through a network system which includes transfer of information across the internet utilizing telephony routing information and internet protocol address information. The system includes integrated Internet Protocol (IP) telephony services allowing a user of a web application to communicate in an audio fashion in-band without having to pick up another telephone. Users can click a button and go to a call center through the network using IP telephony. The system invokes an IP telephony session simultaneously with the data session, and uses an active directory lookup whenever a user uses the system. Users include service providers and manufacturers utilizing the network-based supply chain environment.

18 Claims, 130 Drawing figures

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L4: Entry 1 of 2 File: USPT Mar 28, 2000

US-PAT-NO: 6044355
DOCUMENT-IDENTIFIER: US 6044355 A

TITLE: Skills-based scheduling for telephone call centers

DATE-ISSUED: March 28, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Crockett; Gary B.	Plano	TX		
Leamon; Paul H.	McKinney	TX		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
IEX Corporation	Richardson	TX			02

APPL-NO: 08/ 890228 [PALM]
DATE FILED: July 9, 1997

INT-CL: [07] G06 F 17/30, H04 M 3/50

US-CL-ISSUED: 705/8; 705/9, 705/10, 379/113, 379/34, 379/112
US-CL-CURRENT: 705/8; 379/265.05, 705/10, 705/9

FIELD-OF-SEARCH: 705/8-10, 379/34, 379/92.04, 379/113, 379/134, 379/139, 379/140, 379/265-266, 379/309, 379/112, 379/92.03

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

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PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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5185780	February 1993	Leggett	379/34
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5325292	June 1994	Crockett	705/9

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ART-UNIT: 274

PRIMARY-EXAMINER: Trammell; James P.

ASSISTANT-EXAMINER: Nguyen; Cuong H.

ATTY-AGENT-FIRM: Judson; David H.

ABSTRACT:

A method for scheduling personnel (e.g., agents) in a work environment based on personnel "skill" levels. The method facilitates true skills-based scheduling of agents in a telephone call center using a simulation tool to predict what fraction of scheduled agents from each "skill group" will be available to each "call type" during each time interval being scheduled. A feedback mechanism is used to adjust net staffing and skills usage data between iterations of a call handling simulation until a given schedule being tested through the simulator meets some acceptance criteria.

20 Claims, 11 Drawing figures

DOCUMENT-IDENTIFIER: US 6044355 A
TITLE: Skills-based scheduling for telephone call centers

Abstract Text (1):
A method for scheduling personnel (e.g., agents) in a work environment based on personnel "skill" levels. The method facilitates true skills-based scheduling of agents in a telephone call center using a simulation tool to predict what fraction of scheduled agents from each "skill group" will be available to each "call type" during each time interval being scheduled. A feedback mechanism is used to adjust net staffing and skills usage data between iterations of a call handling simulation until a given schedule being tested through the simulator meets some acceptance criteria.

Application Filing Date (1):
19970709

Brief Summary Text (7):
Calls that arrive at a call center generally are classified into "call types" based on the dialed number and possibly other information such as calling number or caller responses to prompts from the network. The call center is typically served by an automatic call distributor (ACD), which identifies the call type of each incoming call and either delivers or queues it. Each call type may have a separate first-in-first-out queue in the ACD. In most existing call centers, the agents answering calls are organized into one or more "teams," with each team having primary responsibility of the calls in one or more queues. This paradigm is sometimes referred to as "queue/team."

Brief Summary Text (9):
It is known in the prior art to provide ACD systems that depart from the queue/team model described above. Calls are still categorized into call types. In place of queues for the call types, however, queues assoicated with "skills" are provided. The ACD's call distribution logic for the call type determines which queue or queues a call will occupy at various times before it is answered. Agents are not organized into teams with exclusive responsibility for specific queues. Instead, each agent has one or more identified "skills" corresponding to the skills-based queues. Thus, both a given call and a given agent may be connected to multiple queues at the same time. Agent skills designations may be further qualified, for example, as "primary" or "secondary" skills, or with some other designation of skill priority or degree of skill attainment. The ACD call distribution logic may take the skill priority levels into account in its call distribution logic.

Brief Summary Text (10):
In a queue/team environment, when a new call arrived, the ACD determined the call type and essentially asked "Are there any agents available in the team that serves this call type?" If the answer were yes, the team member who had been available the longest would be selected to handle the new call. If the answer were no, the call would be queued, waiting for a team member to free up. Similarly, when an agent became available, the agent would get the longest-waiting call on any of the queues served by the agent's team.

Brief Summary Text (11):
In a skills-based routing environment, on the contrary, the "matching" of calls to agents by the ACD becomes more sophisticated and thus complicated. Agents who have more than one skill no longer "belong" to a well-defined team that handles a restricted set of calls. Instead, the skills definitions form "implicit" teams that

overlap in complex ways. If, for example, a call center has 10 skills defined, then agents could in principle have any of 1024 possible combinations (2.sup.10) of those skills. Each skill combination could be eligible to handle a different subset of the incoming calls, and the eligible subset might vary with time of day, number of calls in queue, or other factors used by the ACD in its call routing decisions.

Brief Summary Text (13):
All agents having a particular combination of skills may be deemed a "skill group." The central problem of skills-based scheduling is then finding a way to predict what fraction of scheduled agents from each skill group will be available to each call type during each time interval being scheduled. If these fractions are known, then the effect of different agent schedules can be generated. Unfortunately, no satisfactory method has been found to calculate the skill group availability fractions directly. These functions depend on the relative and absolute call volumes in each call type, on the particulars of the skills-based call distribution algorithms in the ACD, and on the skills profiles of the total scheduled agent population. Particularly as ACD skills-based routing algorithms themselves evolve and become more sophisticated, the factors affecting skill group availability are too complex for direct analysis.

Brief Summary Text (14):
Thus, there is a need to provide a mechanism to facilitate the production of high-quality schedules to make it easier to manage call centers that use skills-based routing in their ACDs. The present invention solves this important problem.

Brief Summary Text (18):
It is still another important object of the present invention to provide a computer-implemented tool to simulate call handling in a telephone call center to thereby schedule agents in a skills-based workforce environment.

Brief Summary Text (19):
Another important object of this invention is to simulate call handling in a telephone call center environment and use incremental scheduling to produce high-quality schedules in a skills-based routing environment.

Brief Summary Text (20):
It is a more specific object of this invention to facilitate skills-based scheduling of agents in a call center using a simulation tool to predict what fraction of scheduled agents from each "skill group" will be available to each "call type" during each time interval being scheduled.

Brief Summary Text (21):
Yet another object of this invention is to provide a skills-based scheduling mechanism that is adaptable to a wide range of specific ACD skills-based routing methods and is compatible with the constraint and preference handling implementations in existing queue/team schedulers.

Brief Summary Text (22):
These and other objects of this invention are provided in a method for skills-based scheduling method and mechanism. Generally, the invention uses a feedback mechanism involving call handling simulation and incremental scheduling to produce high-quality schedules in a skills-based routing environment.

Brief Summary Text (23):
In accordance with a preferred "skills-based scheduling" method, a computerimplemented tool is used to determine an optimum schedule for a plurality of scheduled agents in a telephone call center, each of the plurality of scheduled agents having a combination of defined skills. The plurality of scheduled agents are organized into "skill groups" with each group including all scheduled agents having a particular combination of skills. The method begins by generating a plurality of net staffing arrays, each net staff array associated with a given call type and defining, for each time interval to be scheduled, an estimate of a difference between a given staffing level and a staffing level needed to meet a current call handling requirement. In addition to the net staffing arrays, the method uses a plurality of skills group availability arrays, each skills group availability array associated with the given call type and defining, for each combination of skill group and time interval to be scheduled, an estimate of a percentage of scheduled agents from each skill group that are available to handle a call. According to the

method, the plurality of arrays are used to generate a proposed schedule for each of the plurality of scheduled agents. Thereafter, a call handling simulation is then run against the proposed schedule using a plurality of ACD call distribution algorithms (one for each call type being scheduled). Based on the results of the call handling simulation, the net staffing arrays and the skills availability arrays are refined to more accurately define the net staffing and skills usage requirements. The process of generating a schedule and then testing that schedule through the simulator is then repeated until a given event occurs. The given event may be a determination that the schedule meets some given acceptance criteria, a passage of a predetermined period of time, a predetermined number of iterations of the process, or some combination thereof.

Brief Summary Text (24):
In a preferred embodiment, a proposed schedule is "optimized" when it provides an acceptable call handling performance level and an acceptable staffing level in the simulation. Once the proposed schedule is "optimized," it may be further adjusted (within a particular skill group) to accommodate agent preferences.

Drawing Description Text (7):
FIG. 4B illustrates the ASA graph and the net staff graph after the output of the scheduler is applied through the ACD simulator in the first iteration;

Drawing Description Text (9):
FIG. 5B illustrates the ASA graph and the net staff graph after the output of the scheduler is applied through the ACD simulator during the second iteration;

Drawing Description Text (11):
FIG. 6B illustrates the ASA graph and the net staff graph after the output of the scheduler is applied through the ACD simulator during the third iteration;

Drawing Description Text (13):
FIG. 7B illustrates these graphs after the output of the scheduler is applied through the ACD simulator during the fourth iteration.

Detailed Description Text (4):
To this end, the present invention provides a method by which a series of call handling simulations are run to generate incremental or "interim" schedules that, through a feedback mechanism, progress toward some "optimum" scheduling solution for the call center. A preferred technique for accomplishing this result is now described. A flowchart describing the preferred technique is shown in FIG. 1. It should be appreciated that these method steps are preferably implemented in a computer. A representative computer is a personal computer or workstation platform that is Intel x86-, PowerPC.RTM.- or RISC.RTM.-based, and includes an operating system such as Windows '95, Windows.RTM. NT, IBM.RTM. OS/2.RTM., IBM AIX.RTM., Unix or the like. Such machines include a known display interface (a graphical user display interface or "GUI") and associated input devices (e.g., keyboard, mouse, etc.).

Detailed Description Text (7):
The method then continues at step 14 to apply the current net staff array(s) and skill group availability array(s) (one for each call type, respectively) to a scheduler. The scheduler can be an extension of a known schedule generation program, e.g., a program used for queue/team scheduling. A representative scheduler program is TotalView.TM., which is available from IEX Corporation, as modified to do multiple iterations as described below. This program takes the net staff array(s) and the skill group availability array(s) input thereto, processes that data, and generates a first iteration of a schedule. The schedule output from the scheduler preferably describes all staffing for a given period of time (typically one or two weeks). For every agent that will be assigned to work during the schedule period, there is a schedule entry for every day the agent will work. The schedule entry preferably indicates what time the agent will start work, when each break or lunch period is scheduled, how long each break or lunch is, and when the agent will finish work. The schedule may exist in several forms, although preferably the form used as input by the simulator portion (in the next step) is a simple ASCII text file.

Detailed Description Text (8):
Thereafter, the method continues at step 16 by applying the schedule to an ACD simulator module to run a call handling simulation. The simulator generally performs the following actions: (1) reads a schedule and creates simulated agents who will

log in, log out, and go on breaks at the times indicated in the schedule (the simulator, of course, runs many times faster than realtime, so a particular simulation of a week's call center activity takes seconds or minutes depending on the size of the call center; (2) generates simulated calls that match the forecasted call volumes for the call types of interest; (3) delivers the simulated calls to the simulated agents using decision logic similar to what would be used by an actual ACD, and simulates the agents'handling of the calls using average handle time statistics provided from other portions of the workforce management system; (4) collects and reports statistics about the simulated call center including, for example, the Average Speed of Answer (ASA) for each call type, the number of simulated calls abandoned by the caller, and the like; (5) estimates the number of additional agents needed (or the number of surplus) for each call type at each simulated schedule interval (a "schedule interval" is, for example, "5" or "15" minutes) so that the simulated answer speed would meet the customer's target; and (6) keeps track of how much simulated time each simulated agent spent on each call type, and how much time each agent was idle. Thus, the call handling simulation in step 16 decides what to do when each simulated call arrives, and when each simulated agent becomes free to handle another call. The specific call handling simulation may be suitably controlled by a call distribution algorithm that may vary depending on the type of ACD being simulated and/or whether or not the ACD supports multiple skills-based priority levels.

Detailed Description Text (9):
Once the schedule is processed in this way, a simulation "pass" is complete. A test is then done at step 18 to determine whether the process is "complete." If the outcome of the test is positive, the method branches to step 20 and outputs a schedule. If, however, the outcome of the test at step 18 is negative, the method "adjusts" the net staffing and availability usage arrays at step 22 (as will be described below) and then returns to step 14 to generate a revised schedule, which is then applied to the simulator in a next "pass" or iteration. The outcome of the test at step 18 may depend on one or more factors, and several alternative approaches may then be used to determine when to stop the process. In a preferred embodiment, the method involves successively iterating and refining schedules multiple times. The results of each iteration may be presented to the user, who would then decide whether to stop or to do another iteration. Thus, a positive outcome of the test at step 18 may occur, in effect, "manually" when the user determines that the process is complete. Alternatively, the method may be run for a fixed number of passes through the simulator, at which point a positive outcome of the test at step would occur. Yet another alternative, is to run the method for a fixed amount of time, with the results of the last pass before time expired being used. In a preferred embodiment, specific schedule quality criteria are defined, with the method being run until those criteria are satisfied (indicating a positive outcome to the test at step 18). The method is compatible with any of these options, or with combinations of them. The choice of termination criteria can be different for each user, and a particular criteria is not essential to the invention.

Detailed Description Text (10):
If the outcome of the test at step 18 is negative, however, a new "pass" or iteration will be run. According to an advantageous feature of the invention, information generated during a previous simulation (and output by the simulator) is then used to adjust the net staffing and skill availability array(s) for the next scheduler pass. This "feedback" technique is designed to drive the method toward an "optimum" schedule, which typically occurs after a plurality of iterations. This operation will be illustrated below. In a preferred embodiment, the information used to adjust the arrays may be as follows. As noted above, the simulator estimates the number of additional agents needed (or the number of surplus) for each call type at each simulated schedule interval so that the simulated speed of answer would meet the customer's target for that interval. This information is thus substituted in the "net staffing" array used to for the next scheduler run. Likewise, as noted above, the simulator keeps track of how much simulated time each simulated agent spent on each call type, and how much time each agent was idle. This information (in addition to the list of skills possessed by each simulated agent) is then used to create the "skills" usage data that comprises the skills availability array for the next scheduler pass. Thus, the step of adjusting the arrays (step 22 in FIG. 1) preferably involves creating new array(s) in which the new net staffing and skill group usage data is substituted for the data in the prior pass.

Detailed Description Text (12):
FIG. 2 illustrates a block diagram of the feedback mechanism. The net staffing

array(s) 30 and skills availability array(s) 32 (in both cases, one for each call type) are supplied to the scheduler 34, which outputs a "current" schedule 36. This current schedule is then applied to an ACD simulator 38, which is controlled by a call distribution algorithm 40. Using call volume and average handle time forecasts for each call type and the current agent work schedule 36, the ACD simulator simulates call arrivals, call distribution and call handling for each call type over the schedule's time range. As noted above, the simulation preferably makes use of skills-based call routing decisions that may be specific to a particular brand of ACD or to a particular customer's programming of its ACD. If desired, the ACD simulation may be run multiple times with the results then averaged. If the process is not complete, information generated by the simulation is used to refine the net staffing array(s) 30 and the skills availability array(s) 32 between each successive iteration. Each iteration preferably involves a call handling simulation run by the ACD simulator module.

Detailed Description Text (14):
The general flow of processing described above applies to all users of the method, as would the existence and use of the net staff and skills usage arrays for each call type. As noted above, the schedule generation program may be different for each user without affecting the overall method. The only requirement is that the scheduling program make appropriate use of the net staff and skill group availability data in evaluating its schedule options. Moreover, the call handling simulation needs to decide what to do when each simulated call arrives, and when each simulated agent becomes free to handle another call. The decision algorithms may be different from one user to another, because they need to simulate the skills-based routing algorithms that will be employed by the user's particular ACD systems. Methods for simulating such routing algorithms and for "plugging in" specific decision modules are straightforward and are outside the scope of the invention being described here.

Detailed Description Text (15):
In particular, ACDs vary in the number and complexity of skills definitions they support for skills-based routing. For example, some support multiple priority levels for skills, some have no priority notion, and some support "primary" and "secondary" skills. In some cases, multi-skilled agents are represented explicitly as having each of the individual skills; in other ACDs each agent has only one skill, so a new skill must be defined for each combination of other skills that an agent might possess. Much of this per-ACD variation can be handled in the ACD-specific routing simulator modules. The method requires only that the skill group divisions in the agent population be understood and available to the method. Means for mapping a specific ACD's skills representation to a suitable internal representation for the method are straightforward and are outside the scope of the invention being described.

Detailed Description Text (16):
A series of iterative schedule/simulation "runs" is now illustrated to show how the inventive feedback technique drives the method toward a high quality schedule. Each of the figures described below includes two separate graphs, an upper graph illustrating an Average Speed of Answer (ASA) of a given call per schedule interval, and the lower graph illustrating a net staff per call type per scheduling interval. FIG. 3 shows these graphs upon initialization (i.e. before a first pass) with call volume forecast data for three Call Types over an 8-hour (15-minute schedule periods) day. The ASA graph is blank because the ACD simulation has yet to run.

Detailed Description Text (18):
FIG. 4A illustrates the graph of net staff versus schedule interval after making a first pass through the scheduler. This is the first pass at creating an agent schedule, using the initial net staff and skills usage estimates. In this example, to get Call Type 3 adequately staffed, the scheduler had to greatly over-staff Call Types 1 and 2. This is because the initial skills usage estimates were unrealistically high. FIG. 4B illustrates the output of the first pass through the simulator. As noted above, the simulator simulates the handling of the predicted call volume by the agents in the first schedule attempt. The results are (as expected) not acceptable. Long call delays build up at the beginning and end of the day (as seen in the Average Speed of Answer graph), and in the middle of the day all the Call Types are significantly over-staffed (as seen in the net staff graph). This output, however, provides a first refinement of the net staff data and a more realistic view of skills usage data. Both the net staff and skills usage data the serve as input for a second scheduling pass, as previously described.

Detailed Description Text (19):
FIG. 5A shows the second schedule run. The ASA graph in FIG. 5A is the same as that shown in FIG. 4B. With the more realistic net staff and skills usage data to work with, the perceived over-staffing and under-staffing is smoothed out, and agent-hours have been cut from the original schedule. FIG. 5B illustrates the results of the second pass through the simulator. The results are much better than the results of the first simulation run, although the simulated call center is still somewhat over-staffed in total. The results of this simulation provides input to another round of refinement on the net staff and skills usage estimates, and then a third schedule run is made.

Detailed Description Text (21):
FIG. 7A shows the fourth and (in this case) final schedule run. The ASA graph of FIG. 7A is the same as that shown in FIG. 6B. This final run trims a bit more from the total scheduled agent-hours, and it has redistributed agents slightly to reduce the mid-day over-staffing. FIG. 7B shows the output of the fourth simulation run. The change from the previous schedule and simulation is subtle, but positive. At this point, the iterative process is considered complete (given the probability of diminishing returns in future passes), and the last schedule is then used for actual call center scheduling.

Detailed Description Text (24):
Use of the present invention provides numerous advantages. In accordance with the present invention, ACD call distribution algorithms are used in evaluating candidate schedules. The reverse is also possible. In particular, by taking a given schedule and running the schedule through the simulation portion (while varying the ACD call distribution algorithms), a "what if" tool is created to evaluate possible changes in the ACD programming. The two uses can then iterate and be used interchangeably. One could generate a schedule as described above, then use the simulator to play with the ACD call distribution, then generate a new schedule tuned to the new distribution algorithm, etc.

Current US Original Classification (1):
705/8

Current US Cross Reference Classification (3):
705/9

Other Reference Publication (1):
ACDs Get Skills-Based Routing --Klenke, Business Communications Review, Jul. 1995 pp. 48-51.

CLAIMS:

1. A method, using a computer, of determining an efficient schedule for a plurality of scheduled agents in a telephone call center, each of the plurality of scheduled agents having a combination of defined skills and wherein the plurality of scheduled agents may be organized into skill groups each including all scheduled agents having a particular combination of skills, comprising the steps of:

(a) generating net staffing data per call type defining, for each time interval to be scheduled, an estimate of a difference between a given staffing level and a staffing level needed to meet a current call handling requirement;

(b) generating skills group availability data per call type defining, for each combination of skill group and time interval to be scheduled, an estimate of a percentage of scheduled agents from each skill group that are available to handle a call;

(c) using the net staffing data and the skills group availability data to generate a schedule for each of the plurality of scheduled agents;

(d) running a call handling simulation against the schedule;

(e) adjusting the net staffing data and the skills availability data as a result of the call handling simulation, and

(f) repeating steps (c)-(e) until an output schedule occurs.

11. The method as described in claim 1 wherein the call handling simulation in step (d) comprises a set of one or more passes through an automatic call distributor (ACD) simulator.

12. The method as described in claim 11 wherein a plurality of passes through the ACD simulator are averaged.

14. A method, using a computer, of determining an efficient schedule for a plurality of scheduled agents in a telephone call center, each of the plurality of scheduled agents having a combination of defined skills and wherein the plurality of scheduled agents may be organized into skill groups each including all scheduled agents having a particular combination of skills, comprising the steps of:

(a) generating a plurality of net staffing arrays, each net staff array associated with a given call type and defining, for each time interval to be scheduled, an estimate of a difference between a given staffing level and a staffing level needed to meet a current call handling requirement;

(b) generating a plurality of skills group availability arrays, each skills group availability array associated with the given call type and defining, for each combination of skill group and time interval to be scheduled, an estimate of a percentage of scheduled agents from each skill group that are available to handle a call;

(c) using the plurality of arrays generated in steps (a)-(b) to generate a schedule for each of the plurality of scheduled agents;

(d) running a call handling simulation against the schedule generated in step (c) using an ACD call distribution algorithm selected from a group of ACD call distribution algorithms;

(e) refining the net staffing arrays and the skills availability arrays as a result of the call handling simulation, and

(f) repeating steps (c)-(e) until a given event occurs, the given event selected from the group of events consisting of a determination that the schedule meets some given acceptance criteria, a passage of a predetermined period of time, predetermined number of iterations of steps (c)-(e), and a combination thereof.

19. A computer program product in a computer-readable medium for use in a computer for determining an efficient schedule for a plurality of scheduled agents in a telephone call center, each of the plurality of scheduled agents having a combination of defined skills and wherein the plurality of scheduled agents may be organized into skill groups each including all scheduled agents having a particular combination of skills, the computer program product comprising:

first means for generating net staffing data per call type defining, for each time interval to be scheduled, an estimate of a difference between a given staffing level and a staffing level needed to meet a current call handling requirement;

second means for generating skills group availability data per call type defining, for each combination of skill group and time interval to be scheduled, an estimate of a percentage of scheduled agents from each skill group that are available to handle a call;

third means responsive to the first and second means for generating a schedule for each of the plurality of scheduled agents;

fourth means for running a call handling simulation against the schedule; and

fifth means responsive to the fourth means for refining the net staffing array and the skills availability data as a result of the call handling simulation for a subsequent iteration.

20. A computer program product in a computer-readable medium for use in a computer for determining an efficient schedule for a plurality of scheduled agents in a telephone call center, each of the plurality of scheduled agents having a combination of defined skills and wherein the plurality of scheduled agents may be organized into skill groups each including all scheduled agents having a particular combination of skills

organized into skill groups each including all scheduled agents having a particular combination of skills, the computer program product comprising:

means for generating a data structure comprising (a) a net staffing array per call type defining, for each time interval to be scheduled, an estimate of a difference between a given staffing level and a staffing level needed to meet a current call handling requirement, and (b) a skills group availability array per call type defining, for each combination of skill group and time interval to be scheduled, an estimate of a percentage of scheduled agents from each skill group that are available to handle a call;

means responsive to the generating means for creating a schedule for each of the plurality of scheduled agents;

means responsive to the schedule creating means for simulating an operation of the telephone call center using the schedule; and

means responsive to the simulating means for refining each net staffing array and each skills availability array as a result of the telephone call center simulation for a subsequent iteration.

End of Result Set

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L4: Entry 2 of 2 File: USPT Dec 7, 1999

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US-PAT-NO: 5999908
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TITLE: Customer-based product design module

9/1)

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INVENTOR-INFORMATION:

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APPL-NO: 08/ 934457 [PALM]
DATE FILED: September 19, 1997

PARENT-CASE:
This is a continuation of application Ser. No. 08/243,638, filed May 16, 1994, now abandoned, which is a continuation-in-part of U.S. patent application Ser. No. 07/926,333, filed Aug. 6, 1992.

INT-CL: [06] G06 F 17/60

US-CL-ISSUED: 705/1; 705/7, 705/10, 434/118
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FIELD-OF-SEARCH: 705/1, 705/7, 705/10, 434/107, 434/118, 434/365, 434/350

PRIOR-ART-DISCLOSED:

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Search Selected | Search ALL

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ART-UNIT: 271

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ASSISTANT-EXAMINER: Dixon; Thomas A.

ATTY-AGENT-FIRM: Fish & Richardson P.C.

ABSTRACT:

The invention may be embedded in products or services that contain a microprocessor and a facility for communication. The resulting two-way interactive media enables relationships to be built with individual customers and groups of customers throughout a product's or service's life cycle. Customers may also be provided with automatic, portable in-use access to constantly updated information during product use, to increase user success and reduce costly and error-filled processes of acquiring product expertise. The invention may interact with customers, gather information from customers, communicate customer information securely to a vendor or external third party(ies), construct and transmit new pre-programmed interactions to the customer communications system in the product, and analyze and report customer information. This new medium provides a worldwide way to transform the use of products and services into interactive two-way dialogues; add in-product performance measures and any specific assistance needed; educate and train customers as their product uses change; permit vendors to discover and respond instantly to market shifts and opportunities; generate and test new ideas; enable customers to guide a vendor or a third party(ies) in satisfying their needs; and other means of using in-product communications to fit business operations with rapidly changing customers and markets. By making two-way learning and information delivery part of the product and service environment, vendors or third parties can become faster, more efficient and accurate in designing, delivering and supporting what customers want to buy.

37 Claims, 35 Drawing figures

End of Result Set

Generate Collection Print

L4: Entry 2 of 2 File: USPT Dec 7, 1999

DOCUMENT-IDENTIFIER: US 5999908 A
TITLE: Customer-based product design module

Application Filing Date (1):
19970919

Brief Summary Text (87):
This Customer-Based Product Design Module (CB-PD Module) invention is designed to embed a new type of product feature within a range of products and services, helping them evolve into Customer Directed Products (CDP) by means of Development Interactions (DI). The result is a continuous source of Aggregate Customer Desires (ACD) and Defined Customer Desires (DCD) from customers and users while they are using these products and services. This serves vendors as a continuous way to listen to Customers and understand their performance, their needs and their expectations.

Brief Summary Text (97):
A CB-PD Module may have varied designs, to fit the functionality of each particular product or service. For a first example, consider a general purpose CB-PD Module. This would be a removable, self-contained module that could be either battery powered or receive its electricity from the product. It includes its own display or speaker for communicating with the Customer; its own keypad or microphone for the Customer to communicate with it; its own microprocessor and memory to run Customer Design Instruments (CDI), interact with the Customer and store the Aggregate Customer Desires (ACD) data that result from those interactions; its own interface to the product to receive signals of specific types of events (such as when the product is turned on and off, when certain product features are activated, etc.); its own means to communicate with the Vendor (such as by an internal modem to link to the telephone network, by a plug to connect to an interface unit like a bar code reader, by a removable chip that stores and carries the data to an external reader, etc.), etc. Some interface and I/O options include the screen, keyboard, keypad, pen, printer, physical buttons on the product, voice (speaker and microphone in any form), modem, phone plug, antenna, corporate network, floppy disk, VANs (value added networks), and third-party service companies that may collect user data. By including such means that are appropriate in each instantiation, this interactive networking invention could be mass manufactured and included in a variety of products and services.

Brief Summary Text (106):
Uses during product development: As a complete turnaround system, the CB-PD Module can help track the testing of new and prototype products during their development, and provide the output of Aggregate Customer Desires (ACD) and Customer-Based Product Design Reports (CB-PDR) to product managers and designers. This keeps the development team informed of Customer responses and recommendations.

Drawing Description Text (7):
FIG. 5 is an illustration of a CB-PD Module directly transmitting Aggregate Customer Desires (ACD) data through the telephone network.

Drawing Description Text (14):
FIG. 12 is a flow chart of a process associated with the growth of Aggregate Customer Desires (ACD) databases.

Detailed Description Text (6):
(c) Customer Design Instrument (CDI) is a specific set of Customer Probes (CP) that

are intended to elicit the raw data, which are called Aggregate Customer Desires (ACD).

Detailed Description Text (9):
(f) Aggregate Customer Desires (ACD) are the raw data that results from customer use of the CB-PD Module.

Detailed Description Text (10):
(g) Customer Data Reader/Programmer (CDRP) is a hardware device used in the collection and/or transmission of Aggregate Customer Desires (ACD) data to a Vendor, and in programming the CB-PD Module.

Detailed Description Text (26):
Turning now to FIG. 1, the overall Customer Design System (CDS) describes the process by which Customers, by means of the CB-PD Module, can direct, guide or assist the Vendors of Customer Directed Products (CDP), which contain such a module. This process begins with a Vendor setting product, market or other commercial objectives 10 and then designing the product 12. One of the product's features will be a CB-PD Module 14, which will include a custom Customer Design Instrument (CDI) specific for that product. As the Customer uses the product 16, pre-programmed trigger points are checked in the CB-PD Module 18. These trigger points may be initiated by the CB-PD Module or by the Customer. If a trigger point has not been reached, the Customer's use is not interrupted. If a trigger point is reached, the CB-PD Module requests the Customer's participation in a Development Interaction (DI) 20. If the Customer says no, then that trigger point is passed without a DI occurring. If the Customer agrees, a Development Interaction is performed 22. This includes running the Customer Design Instrument (CDI) and recording the Aggregate Customer Desires (ACD) 24, which are comprised of the Customers responses during the Development Interaction. The Aggregate Customer Desires are delivered to the Vendor 26 where they are entered into an Aggregate Customers Desires (ACD) database. Periodically, a report is run 28 which analyzes the aggregate data into Defined Customer Desires (DCD) comprised of the Customer's views and suggestions during that period. This is presented in an on-line or printed Customer-Based Product Design Report (CB-PDR) 28. This Customer information is used to help improve products, services, marketing and other areas of business operations 30, and is fed back into an iterative design 12. Whenever needed, the Customer Design Instrument is updated 14, and distributed by a variety of means (such as including it in the new products sold) to Customers.

Detailed Description Text (63):
The CPU/ROM Memory 146 is a microprocessor plus ROM and RAM memory 158. The memory 158 may be volatile, which requires constant electric power (i.e., conventional DRAM) or it may retain its data without requiring power (i.e., nonvolatile "flash" memory). A separate unit is not specified for physical storage of the Customer Design Instrument (CDI) and the Customer's Aggregate Customer Desires (ACD) data (i.e., a miniature hard or floppy disk) since memory technology is evolving rapidly Currently, "flash" memory provides system BIOS; replaces ROMs, DRAMs and SRAMs; and is beginning to replace floppy and hard drives in various systems.

Detailed Description Text (66):
The display controller 144 delivers ASCII text to the display 142 The display provides menus, instructions, probes, messages and other communications to the Customer. With the display 142 and keypad 148 together, the CB-PD Module is capable of conducting a Development Interaction (DI) with the Customer. This may be initiated by the Customer or by the CB-PD Module Memory 158 provides digital storage for one or more Customer Design Instruments (CDI), customer data from Development Interactions (DI), etc. in small data files or in a database of Aggregate Customer Desires (ACD). The power sources 46, 56 shown in FIG. 2 supply electric power to the electronic circuit of the CB-PD Module shown in FIG. 6. An optional clock/calendar circuit 140 may be included to provide a trigger for running Development Interactions (DI), to stamp the time and date of each DI in the Aggregate Customer Desires (ACD) file, to log the frequency of use of the product or of certain features of it, etc.

Detailed Description Text (69):
Based on the present embodiment, Development Interactions (DI) are recorded during the use of a Customer Directed Product (CDP) and stored in memory 158 When the CB-PD Module is enabled for I/O (based on the method built into the Module 166, 170, 176) and the appropriate function key pressed 58 in FIG. 2, the Module transmits its

Aggregate Customer Desires (ACD) data. If the Vendor would like to re-program the CB-PD Module, the new program (such as a new Customer Design Instrument) is received by the Module by the communications method built into the Module 166, 170, 176 and stored in memory 158.

Detailed Description Text (71):
The CPU/ROM Memory 186 is a microprocessor plus ROM and RAM memory 198. The memory 198 may be volatile, which requires constant electric power (i.e., conventional DRAM) or it may retain its data without requiring power (i.e., "flash" memory). A separate unit is not specified for physical storage of the Customer Design Instrument (CDI) and the Customer's Aggregate Customer Desires (ACD) data (i.e., a miniature hard or floppy disk) since memory technology is evolving rapidly. Currently, "flash" memory provides system BIOS; replaces ROMs, DRAMs and SRAMs; and is beginning to replace floppy and hard drives in various systems.

Detailed Description Text (73):
The display controller 184 delivers ASCII text to the display 182 Depending on the UI, menus, instructions, probes, messages and other communications may be made with the Customer by means of the display, voice or a combination of both Memory 198 provides digital storage for one or more Customer Design Instruments (CDI), customer data from Development Interactions (DI), etc. in small data files or in a database of Aggregate Customer Desires (ACD). The power source is directly from the facsimile machine 70 which remains powered at all times to preserve its user-programmed memory; this also supplies electric power to the electronic circuit of the CB-PD Module shown in FIG. 7. Either the facsimile machine's 70 clock/calendar circuit or an optional CB-PD Module clock/calendar circuit 180 may be included.

Detailed Description Text (80):
Based on the present embodiment, Development Interactions (DI) are recorded during the use of a Customer Directed Product (CDP) and stored in memory 198. When the CB-PD Module is enabled for connection to the Vendor's computer by pressing the appropriate function key 80, the CB-PD Module transmits its Aggregate Customer Desires (ACD) data. If the Vendor would like to re-program the CB-PD Module, the new program (such as a new Customer Design Instrument) is received by the Module 206, 204 and stored in memory 198.

Detailed Description Text (142):
Re-programming a CB-PD Module: Another of these options 240 provides the means to re-program CB-PD Modules 243 after they have connected with the Vendor's computer and uploaded their Aggregate Customer Desires (ACD) data. This provides the automated ability to update the Customer Design Instruments (CDI) and triggers in specific sets of CB-PD Modules, whether they are located locally or remotely, by means of a Customer Data Reader/Programmer (CDRP) 92 in FIG. 4, by means of a direct link with the Vendor's computer if the CB-PD Module is built into a Customer Directed Product (CDP) such as the facsimile machine 70 in FIG. 3, or by other means.

Detailed Description Text (282):
Turning to FIG. 11, transmission takes place by means already described. Once there are one or more Aggregate Customer Desires (ACD) data files in memory 320, when an appropriate time occurs to transmit this data to the Vendor 293, 312 the Customer takes the appropriate step for the particular configuration of the CB-PD Module in a Customer Directed Product (CDP). Some examples of the configurations possible include the facsimile machine 70 in FIG. 3, the CB-PD Module 120 in FIG. 5 and the Customer Data Reader/Programmer (CDRP) 92 in FIG. 4.

Detailed Description Text (286):
If the Customer does not want to transmit the Aggregate Customer Desires (ACD) data to the Vendor when requested 334, then these data files are simply retained 320 in the CB-PD Module's memory 158 in FIG. 6 until they are transmitted.

Detailed Description Text (287):
Optionally, the stored Aggregate Customer Desires (ACD) data may be encrypted. This protects it from theft, tampering, or other types of interference or damage. For example, if a standardized CB-PD Module were added to a variety of electronic products, it could become routine for a third-party service and repair business to remove them from those products 322, 324, insert them into a Customer Data Reader/Programmer (CDRP) and press a function key to transmit the data to the appropriate Vendor 326 (and the Vendor's computer would update the CB-PD Module

while it was on-line). For another example, if multi-direction communications are possible with a CB-PD Module, then multiple third-parties may be able to establish communications links with the CB-PD Module. In those and in other types of situations, it may be desirable to encrypt the Aggregate Customer Desires (ACD) data, to prevent the CB-PD Modules from being read and their data sold to competitors.

Detailed Description Text (288):
With an encrypted data file 320, it would pass through the Customer Data Reader/Programmer (CDRP) in its encrypted format 326, or be transmitted directly to the Vendor's computer in its encrypted format 332. In neither case would there be any external access to a decrypted data file, or to the security keys or security procedures that would decrypt a data file. The ability to decrypt the Aggregate Customer Data (ACD) 338 would be retained entirely inside the Vendor's computer, and internal security procedures (such as those in 340-356 inclusive) could be used to protect access there, as well.

Detailed Description Text (294):
(e) Interactive Services Function: What types of information and services could be built into the CB-PD Module, what problems it could direct them to avoid, what problems could be corrected, what specific advantages they might gain from that information, what specific accomplishments they might make with that information, "what if" opportunities for simulations in using the product in certain ways ("try before using"), training exercises that might be included in the CB-PD Module, services that can be delivered by the Vendor, schedule activities with Vendor employees, etc.

Detailed Description Text (300):
The CB-PDR is illustrated in FIGS. 12 and 13 inclusive. The system includes one or more computers at the Vendor 660 in FIG. 17 having an input via telephone 116 in FIG. 4 or other means for receiving Aggregate Customer Desires (ACD) data 378. A procedure is used to determine that this communications is valid and satisfies the operative criteria regarding CB-PD Module identification, product identification, Customer Design Instrument (CDI) identification, etc.

Detailed Description Text (301):
In one such means for determining that this is a valid communication, the transmission of incoming ACD data 360, 378 are first validated by examining the CB-PD Module's ID 362, 364, 366, 368 to assure that this is an authentic CB-PD Module. If not, a message is sent to the transmitting means 368 (such as a Customer Data Reader/Programmer or a CB-PD Module) and an error record is written 368 in a file in the Vendor's computer. The specific Customer Data Instrument (CDI) is then validated by examining its ID 370, 372, 374, 376 to assure that this is an authentic CDI. If not, a message is sent to the transmitting means 368 and an error record is written 368 in a file in the Vendor's computer. Similar processes and checkpoints may be instituted for validating any component of the data file, data elements, etc.

Detailed Description Text (302):
Data validation and transmission may occur in any order. In one such method, after validation 362-376 inclusive, the Aggregate Customer Data File (ACD) is transmitted 378 and appended or merged into the Vendor's Aggregate Customer Data (ACD) database 380. If there is another data file in the CB-PD Module 382, its Customer Design Instrument (CDI) ID is validated as described above 370-376 inclusive. If the CDI is valid the data file is transmitted 378. If there are not any more data files to transmit, the CB-PD Module is updated 384, 386. The updating 386 may include downloading actions described above 238, 240, 242, 243 in FIG. 8 and deleting from the CB-PD Module's memory the data files transmitted to the Vendor's computer 386. It may also include other functions such as reading the CB-PD Module's clock/calendar and re-setting it if it is not correct, reading the Module's transmission procedures and updating them if they have changed (such as switching to a new communications vendor, etc. After the CB-PD Module is updated, a thank you message is displayed for the Customer 388 and the communications link is terminated 388.

Detailed Description Text (303):
When entered in the Vendor's computer(s) 116 in FIG. 4, the Aggregate Customer Desires (ACD) data is stored as part of one or more ACD databases in a format that allows the particular data from each particular Customer Design Instrument (CDI) to

be addressed and extracted to produce its own Customer-Based Product Design Report (CB-PDR); and by a format that allows the data from user-selected groups of Customer Design Instruments (CDI) to be collected and merged to produce integrated Customer-Based Product Design Reports (CB-PDR) that report the data from the same Customer Probes (CP) used in different Customer Design Instruments (CDI). This permits the analysis and reporting of Customer data by product, by common product features across a product line, etc.

Detailed Description Text (319):
In addition, automated triggers may be set up to run and deliver System Initiated Reports (SIR) automatically 414. In this case, when a trigger (such as a date, time, number of records in the Aggregate Customer Desires (ACD) database, etc.) 414 is reached, the report appropriate for that trigger is read 416 (such as for a particular Customer Directed Product (CDP) or other report parameters as described above) and the report is run 416. After the report is run 418 it is automatically sent on-line to a pre-set delivery list 418 (such as via E-mail or other delivery means), or it is printed automatically for physical delivery to a delivery list 418. These delivery lists may be internal to a single location such as a corporate headquarters, it may be multi-location such as to appropriate managers throughout a multi-national corporation, it may include third-parties such as OEM or components suppliers who participate in designing future product improvements, etc.

Detailed Description Text (473):
Thus, a possible economic impact is that this invention may cause a material transformation in products, services and Vendor-Customer relationships by producing a Networked Marketplace (NM) in which all participants may experiment with varying degrees of influence. This produces potentials for evolving toward an economy where Aggregate and Defined Customer Desires (ACD and DCD) help direct and control manufacturing, services, distribution, training customer support, etc. This would transfer some commercial control, guidance and direction from Vendors to Customers. It would redefine Customers based on their competence, preferences, buying power and control.

Detailed Description Text (486):
For example, if the Customer Directed Product (CDP) is a PBX telephone system with several thousand users in one corporation, those users could be scattered in a number of locations. A single, centrally located CB-PD Module could use the voice, LED display, keypad and other features of the PBX system and its individual phone stations to investigate the utility, efficiency, user-friendliness and other aspects of the features of that PBX system. For example, it might ask appropriate questions after each Nth use of a particular feature 282 in FIG. 10 such as conference calls that include at least two internal and two external participants. It could read the appropriate Customer Design Instrument (CDI) 284 and "call" the user who set up the conference call after it was completed, to request participation 268. If the user chose to participate, the probes 294 might investigate whether or not the user felt a conference call was easy to set up, what problems were encountered and what could be done to make this feature simpler, faster and less prone to errors. The user could reply by pressing numbers on the keypad 296 or by speaking replies into the telephone handset 296 that are recorded as audio or digital records 304. At periodic pre-set intervals, the CB-PD Module could dial the Vendor 328 in FIG. 11 and send the Aggregate Customer Desires (ACD) data from its various Development Interactions (DI).

Detailed Description Text (488):
For example, in the embodiment in FIG. 3, the facsimile machine 70, can demonstrate how a centrally located CB-PD Module might interact with many individual products and customers that are in many distant locations. The preferred embodiment that was taught included the microprocessor/ROM memory 186 and memory 198 inside the facsimile machine 70. The CB-PD Module was located inside the product; it controlled the entire Development Interaction (DI) with the Customer locally and then connected to the Vendor's computer to transmit the resulting data. As an alternative, a custom microprocessor 186 in FIG. 7 may perform only the hard-wired functions of triggering the Development Interaction (DI) at certain events and, after obtaining the Customer's participation, connects the Customer Designed Product (CDP) 70 to the Vendor's computer. In this configuration, the digital-analog converter 194 and the analog-digital converter 196 would be located within the Vendor's computer and the Customer Designed Product 70 would not contain a modem 204. The Customer would conduct the Development Interaction (DI) 284 in FIG. 10 by means of voice spoken through the facsimile machine's handset 74, 78 which is then transmitted via a

telephone line directly to a CB-PD Module located in the Vendor's computer. That centrally located Module would conduct the Development Interaction (DI) 294-308 inclusive and record the Aggregate Customer Desires (ACD) 304 directly in the ACD database within the Vendor's computer.

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